THE

JOURNAL

OF

THE ASIATIC SOCIETY

OF

BENGAL.

VOL. I.

THE

JOURNAL

OF

THE ASIATIC SOCIETY

OF

BENGAL.

EDITED BY

JAMES PRINSEP, F. R. S.

SECRETARY OF THE PHYSICAL CLASS, ASIATIC SOCIETY.

VOL. I.

JANUARY TO DECEMBER,

1832.

"It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science, in different parts of *Asia*, will commit their observations to writing, and send them to the Asiatic Society at Calcutta; it will languish, if such communications shall be long intermitted; and it will die away, if they shall entirely cease."

SIR WM. JONES.

Calcutta:

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1832.

TO

CAPTAIN JAMES D. HERBERT,

Bengal Infantry,

LATE

DEPUTY SURVEYOR GENERAL OF BENGAL, AND SUPERINTENDENT OF REVENUE SURVEYS;

AT PRESENT HOLDING THE APPOINTMENT OF

ASTRONOMER TO HIS MAJESTY

The King of Oude:

WHOSE JUDGMENT ORIGINATED; WHOSE PERSEVERANCE AND EXERTIONS SUCCESSFULLY ESTABLISHED; AND WHOSE SUPERIOR ABILITIES SUPPORTED FOR 3 YEARS,

THE FIRST JOURNAL

IN INDIA

DEVOTED TO THE EXCLUSIVE PUBLICATION

OF

GLEANINGS IN SCIENCE;

THIS VOLUME,

IN ALL RESPECTS, BUT TITLE, A CONTINUATION OF HIS OWN WORK,

IS

Inscribed,

BY HIS ATTACHED FRIEND,

THE EDITOR.

CALCUTTA,
January 1, 1833.

PREFACE.

The ASIATIC SOCIETY, on the 7th March, 1832*, passed a resolution, that the monthly journal hitherto published under the name of "GLEANINGS IN SCIENCE," should be permitted to assume that of JOURNAL OF THE ASIATIC SOCIETY, and to continue it as long as the publication remains under the charge of one or both of the Secretaries of the Society. This privilege has, as it was anticipated, been the means of extending very considerably its circulation, while it has given a character and authenticity to the work, by its connection with an institution of established literary reputation, which no anonymous magazine, however well conducted, could hope to command.

The advantages of extended circulation have reacted to the benefit of subscribers, by enabling the Editor to increase the quantity of letter press from 400 to nearly 600 pages; and yet so constant has been the growing support of its contributors, that the pages of THE JOURNAL have been devoted, with few exceptions, to the insertion of original communications.

To many readers it would doubtless have been preferable that THE JOURNAL should contain more copious extracts from English scientific periodicals, which are not procurable in the interior of India; but conceding that, as an organ of Indian scientific intelligence, it must obviously derive its only merit among the many similar periodicals of the present day, from its stores of *oriental* literary and physical research, it will be generally acknowledged, that the first object of the work should be to give publicity to such oriental matter as the antiquarian, the linguist, the traveller, and the naturalist may glean, in the ample field open to their industry in this part of the world. While acting

* The January number was not published until the middle of March.—Since then exertions have been made to bring up arrears, and in future each monthly number will appear with regularity on the 10th of the following month; the insertion of the meteorological register rendering an earlier issue impossible.

on this principle, however, the Editor has not lost sight of the great utility of following, as far as means would permit, the progress of the various sciences at home, especially such as are connected in any way with Asia; the only limits thereto being want of space, and want of time to peruse and extract from the vast number of publications of the present day. Want of room also precluded the possibility of republishing the proceedings of the Medical and of the Horticultural Societies; but this had become less urgent since both of those useful bodies adopted the excellent rule of giving early publicity to their own proceedings and records.

To the Asiatic Society THE JOURNAL has naturally looked for its most frequent and interesting communications; and in consequence of its more intimate connection with that Institution, the proceedings of that body have been given in greater detail than heretofore, so that absent members may learn exactly what passes at its meetings, and what accessions are made from time to time to its library and its museum. Many absent members have complained of the quarterly subscriptions they were heretofore called upon to pay, while they remained in ignorance of what was going forward; this source of objection is now obviated, and perhaps a still greater amendment may yet be effected for their benefit, by an arrangement that all members of the Society shall receive a copy of the Journal gratis, which will reduce their annual payments nearly one fourth.

It is unnecessary to recapitulate the contents of the present volume, or to allude in anonymous praise to those who have favored its pages with their assistance; since the authors have, in most cases, on suggestion, permitted their writings to be authenticated by the insertion of their names, as should always be the case in matters of fact, observation, and research. One illustrious name however must not be passed over without a tribute of gratitude for its valued and frequent contributions, a tribute more sincerely paid, since India has now lost the power and the claim to their continuance; she has resigned her most eminent oriental scholar to climes where his talents may find more genial appreciation, but where they cannot excite more respect or admiration, than they will ever command in the land which called forth their energies and directed their application.

The learned Societies at home will be proud to publish the continuation of the *Analyses of the Purânas*, of which the four first have appeared in these pages. Abstracts of four only were ready for the press, but translations of the remainder of the eighteen *Purânas* themselves had been completed under the superintendence of Professor Wilson, before he quitted India.

Mr. Alexander Csoma's indefatigable labour, in opening to us a first acquaintance with the literature of Tibet, will be estimated as it deserves by literary men—a contracted circle perhaps, because deep erudition and study are requisite to form critics capable of appreciating the nature and bearing of his peculiar researches upon the history, languages, and religions of other nations, both ancient and modern. All may however feel sensible of the devotion, zeal, and perseverance, which are necessary to lead a man, alone and unpaid, into a distant and wild country, to learn its language, and study its people at the fountain head. The volumes of notes which Mr. Csoma has presented to the Asiatic Society, will, it is hoped, be published in their Researches at length.

In furtherance of the desire of the Government, the greater part of Dr. Buchanan's Statistics of Dinajpúr has been printed in a detached form, as commenced by the Editor of the GLEANINGS; and to complete the work more speedily, two extra numbers have been issued in the course of the year. It will be remarked, that there are many plates referred to in the text: the drawings alluded to are in possession of the Honorable Court of Directors, along with the original manuscripts; it was thought better to preserve the references, in case the Hon'ble Court might hereafter be persuaded to publish them, either in a separate form, or of a size adapted to the present edition. It must not be forgotten, that it is this undertaking which gained to the GLEANINGS the valuable privilege of free postage through the Bengal Presidency. The Editor is happy to announce, that the same boon has, in the most liberal manner, and without any solicitation, been extended to the Presidency of Bombay and to the Government of Ceylon, by their enlightened Governors, His Excellency the Earl of CLARE, and the Right Honorable Sir R. W. HORTON, to whom his thanks are thus publicly and respectfully addressed.

To his numerous correspondents, the Editor can but proffer thanks for past, and solicitations for future, support, bidding them remember that, the scope and object of this publication embraces the literature, the manners, the geography, physical and mineral, the arts, the natural productions of Asia, the phenomena of its climate, and observations of the heavens. In the words of the illustrious founder of the Asiatic Society, " the bounds of its investigation will be the geographical limits of Asia; and within these limits its inquiries will be extended to whatever is performed by man or produced by nature."

Dedicated, by permission, to

LADY W. C. BENTINCK,

A

TREATISE

ON

THE MUSIC OF HINDOOSTAN,

COMPRISING A DETAIL OF

THE ANCIENT THEORY

AND

MODERN PRACTICE.

THE similarity of the music of Egypt and Greece to that of this country has been traced and pointed out: harmony and melody have been compared: and time noticed. The varieties of song have been enumerated, and the character of each detailed: a brief account of the principal Musicians superadded, and the work concluded with a short alphabetical glossary of the most useful musical *Terms*.

BY

CAPTAIN N. WILLARD,

Commanding in the Service of H. H. the Nuwab of Banda.

Price to Subscribers, Sa. Rs. 8.

PROSPECTUS.

A TREATISE on the Music of Hindoostan was much wanted. The scanty information obtainable through the channels of Dr. GILCHRIST and Sir WILLIAM JONES, are neither of themselves sufficient to fill this chasm, nor do they elicit light sufficient to enable one to grope through the various obscure writings in the vernacular languages and dialects. The songs set to music by Mr. BIRD and Mr. WALKIER, are of the more modern style, and not of the ancient school; so that, instead of elucidating the theory, they lead us into confusion, when compared with the tables of Rags and Raginees given by Sir W. JONES.

The forthcoming work has been written with the view of describing in some measure, the theory and practice of the original music of Hindoostan, but chiefly to unfold the beauties of which it is susceptible. The extravagant eulogium offered to the music of ancient Greece, and the striking similarity which appeared to the author to exist between that and the subject to be treated of in this work, has led him to point them out, in the hope that, should a taste for the music of this country obtain among the professors of the science in Europe, it might perhaps conduce to the elucidation and revival of a much-desired and lost branch of knowledge, namely, the music of ancient Egypt and Greece.

For this purpose it appeared to the author, that a bare translation of any of the existing native works would not suffice. All who have been taught music are so much accustomed to the European way of explaining it, that every other must necessarily appear uncouth and preposterous. In the arrangement of this work, therefore, the European system has been adopted.

CONTENTS.

N. B. *The work will be printed on superior English paper, at the Baptist Mission Press, Calcutta.*

Subscriptions will be received hy Mr. A. Jewell, Moorghehuttah, and Messrs. Thacker and Co. St. Andrew's Library.

CONTENTS.

No. 4.—APRIL.

No. 5.—MAY.

DIRECTIONS TO THE BINDER.

The sheets of Buchanan's Statistics are to be separated from the monthly numbers. The Plates may either be bound up at the end of the volume, or in the following order :

ERRATA.

Page 10 line 9 *for* "wool," *read* "wood."
—— 11 — 7 *from bottom, for* "plate 1, fig. 2," *read* "plate 2, fig. 1."
—— 14 *last line, for* "delomite," *read* "dolomite."
—— 19 — 16 *from bottom, for* "3, 4, 5," *read* "1, 2, 3, 4."
—— 20 — 8 *from top, for* "plate 1," *read* "plate 2."
—— 20 — 9 *for* "he protracted," *read* "the protracted."
—— — — 11 *for* "BB″ B′," *read* "B″ B′."
—— — — 16 *for* "intercepts," *rsad* "intersects."

AND

In Fig 2, *plate II.* continue the dotted arc 1′ 1 *a″* to *a′*.
The line A *c′* continue to *c*.

—— 28 — 7 *from top, for* "manima," *read* "minima."
—— — *at bottom, for* "Artesien," *read* "Artesian."
—— 33 — 7 *for* "January," *read* "February."
—— 410 — — *in last column* of Table II. *for* "2m. 58s. 8," *read* "0m. 58s. 8."
—— 46 — 18 *from top, after* "which" *insert* "comma."
—— — — — ——————— "either" ditto.
—— 47 — 2 *from top, for* "have," *read* "has."
—— 57 — 12 *for* "99¼ 99½ 99¾," *read* "99^1 99^2 99^3."
—— 59 — 24 *and throughout the article, for* "sack," *read* "sac."
—— 60 — 4 "orbitar," *read* "orbital."
—— — — 10 "interval," *read* "internal."
—— — — 29 "lips," *read* "tips."
—— — — 34 *dele* "by."
—— 60 — 15 *for* "compressed and hard; before," *read* "compressed and hard before;"
—— — — 28 *for* "lips," *read* "tips."
—— 62 — 11 *for* "this Chiru," *read* "the Chiru."
—— 63 — 10 *for* "bambdoidal," *read* "lambdoidal."
—— — — 14 *for* "malars," *read* "molars."
—— 65 — 8 *for* "1⅛," *read* "$\frac{3}{16}$."
—— 67 — 2 *from bottom, after* "than," *read* "the."
—— 74 — 15 *for* "9°," *read* "9^h."
—— 75 — 21 *dele* "rufous," repeated.
—— 79 — 17 *from bottom, for* "done," *read* "donc."
—— 148 — — *foot note, for* "Rutboo," *read* "Kubboo."
—— 226 1st par. 5th line *for* "Ekadantashtra," *read* "Ekadanshtra,"
—— 226 4th „ 4th — *for* "Kridama," *read* "Srid'ama"
—— 229 2nd „ 5th — *for* "Vrishapati," *read* "Vrihaspati."
—— 231 — „ 3rd — *for* "Viswaséna" *read* "Viswakerma."
—— 238 — „ *after* "Ganges river," *insert* "at Gházipur."
—— 245 10 „ *from bottom, for* "it," *read* "the mirror."
—— — 1st „ 7th — *for* "He having," *read* "Having."
—— 296 line 3 *for* "but mostly," *read* "and,—"
—— — — 7 *for* "hydrogen. When," *read* "hydrogen, where."
—— 305 — 20 *for* "circumference," *read* "diameter."
—— — — 21 *for* "27⅓ rupees," *read* "2½ rupees."

Errata in Meteorological Register, for June.

Date	Hour.		Bar.		
13	Sun-rise,	*for*	,365	*read*	,465
14	,,		,399		,499
22	,,		,517		,617

Add 0,010 to all the figures in the Barometrical column for 10½ P. M.

—— 340 — 6 *after* "*Rhinolphus,*" *insert* "and two species of *Vespertilio.*"
—— 355 — 13 *for* "ακανσα," *read* "ακανστα."
—— 355 — 2 *from bottom, after* "*nílam,*" *insert* "*níl mani,* (or *manik.*)"
—— 356 *after* "College of Fort William," *insert* "the word *bahrmani* is also used in the *Khawás-ul* [illegible]*ír,* as a variety of the *yaqút.*"
—— 358 — 20 *dele* "or a species of garnet."
—— 358 — 22 *for* "*manik,*" *read lálri.*"
—— 403 — 5 *from bottom, for* "ΔΙΟΚΛΠ," *read* "ΔΙΟΚΛΗ."
—— 404 — 14 *for* ΟΥΑ," *read* "ΟΥΑ."
—— 411 — 8 *for* "Latitude 25° 43′," *read* "Lat. 25° 47′ 26″."

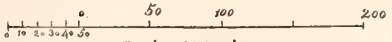
In Table IV. of the Estimate of Life in India, page 284, the first four figures in the second and third column should stand thus:

Age.	Survivors.	Deaths.
20	52221	473
21	51748	489
22	51259	522
23	50737	557

The mistake arose from the calculations having originally been made to commence with the age of nineteen, instead of twenty: and the 5 year averages in Table III. page 283, will all be slightly affected by the same cause. The last figure in the second column, page 284, should be reversed; and in the last column but one, *for* "2080," *read* "2008."

Line 414 line 3 *from below, for* "molluscæ," *read* "mollusca."
—— 444 — 36 *after* "ministry," *insert* "of a man."
—— 445 — 3 *from below, for* "2125," *read* "212.5."
—— 446 — 7 *for* "in bullion," *read* "bullion."
—— 447 — 21 *for* "will be," *read* "would be."
—— — — — *after* "at any," *insert* "rate."
—— 480 — 15-16 *for* "Tariqa-i-Chishíta," *read* "Tariqa-i-Chishtía."
—— 483 — 36 *for* "lost about," *read* "tost about."
—— — — 39 *for* "Mújtahid-i-mústuqill," *read* "Mújtahid-i-mústaqill."
—— 485 — 20 *for* "Taqwiat-ul-Imám," *read* Taqwiat-ul-Imán."
—— 487 — 15 *erase* "5" at beginning of line.
—— 488 — 7 *for* "differences," *read* "difference."
—— 489 — 20 *for* "Káfr," *read* "Kufr."
—— 491 — 23-24 *for* Ishrák f'il Tasarraf," *read* "Ishrák f'il Tasarruf."
—— 492 — 10-11 *for* "the authority or influence of Saints, as respecting intercessors," *read* "respecting the authority or influence of Saints as intercessors."
—— 498 — 23 *for* "Khátim," *read* "Khátima."
—— 501 — 12 *after* "A B C," *insert* "[fig. 5.]"
—— 505 — 20 *for* "5 53 59," *read* "5 52 59."
—— 506 — 11 *for* "5 53 10," *read* "5 53 27."

Plan of the H. C.s Botanic Garden at SEHÁRANPÚR.



References.

1 Linnean garden.
2 Medicinal do
3 Agricultural do
4 Horticultural dep.
5 Doab Canal tree nursery
6 Nursery for hill Plants
7 Artificial rock for do.
8 Conservatory
9 Nursery of Fruit trees
10 ..... Cuttings
11 ..... Seedlings
12 ..... bulbous roots
13 Tool house
14 Bullock Shed.
15 Chabutra.
16 Tanks
17 Wells
18 Gardener's house
19 Mill & Cut from Doab Canal
20 Animal and Vegetable compost grounds
21 Hindú temple
22 Satí monument.
23 Samals

J. B. Fassin Lith.

JOURNAL

OF

THE ASIATIC SOCIETY.

No. 2.—February, 1832.

I.—*Account of the Honorable Company's Botanic Garden at Seháran-púr. By* J. F. Royle, Esq. *late Superintendent.*

[Read before the Physical Class, 7th January, 1832.]

As vegetables contribute a great proportion of the food of man, conduce much to his comfort, supply many of the most valuable medicines, afford a variety of products useful in almost every œconomical art, and produce some of the most beautiful objects for the gratification of the most elegant tastes; the study of plants becomes one of the most extensive, and at the same time most interesting branches of natural knowledge.

The first stage in this study is, the accurate discrimination of plants, and this constitutes the science of *Systematic Botany*. The second is, their naturalization in any particular situation; for a successful realization of which, and not a dependence upon chance, a knowledge is necessary of the *Geography of plants*, or an acquaintance with the places where plants naturally grow, and the causes which influence their distribution over the globe. *Applied Botany* forms the third stage, for which the two others are preparatory, and consists in a knowledge of the various products of plants, whether useful as articles of diet, or as medicinal agents, or for their œconomical properties.

For the promotion of the study of plants, gardens have been so generally established, that no capitals, and few great towns indeed, of civilized nations exist which do not possess such institutions, frequently maintained at a very considerable expence in the most unfavourable situations, where the difficulties opposed by nature are overcome by the ever-varying resources of art; and the successful result is displayed, in the productions of nature which luxuriate only under the heats of

an equatorial sun, being seen in all their beauty alongside of plants which would naturally languish if not braced by the cold of almost polar winters.

A Government, in forming an establishment for the naturalization of plants, will only do so with the most expanded and philosophical views; and as climate is the great regulator in the distribution of vegetable forms, it is obvious that as this is dependent chiefly upon latitude and elevation, such institutions placed at the extreme and central points of an extended territory, particularly if there should be any mountains in their vicinity, would insure the most extensive success, and be enabled to distribute to every part of the country the beneficial results of their experiments.

The territories of the Indian empire, extending from 8° to 31° of northern latitude, and including within their bounds the most stupendous mountains of the world, afford a varied and magnificent field for the naturalization of the valued productions of every region of the globe.

The utility of such institutions, however, depends not only upon their intrinsic merits, but also upon the inhabitants of a country being sufficiently enlightened to profit by their advantages. In India, the European residents are in general too unsettled to take much interest in that which is intended for permanent advantage, while the natives themselves are too well satisfied with the course followed by their forefathers to think of adopting any practice which has not the sanction of their experience. On such accounts, therefore, the benefits spread by such institutions may be less rapid, but they will not be less certain. For the enlightened policy which now sanctions the diffusion of European knowledge among the natives of India cannot fail to produce a class, who will not only desire their existence, but contribute even to their support; and in proportion as they are able to appreciate their tendency, so will they endeavour to benefit by their progress.

The most southern parts of the Indian peninsula afford a favorable site for naturalizing all the tropical productions which grow within 15° north and south of the line, while the Nílgherís, between 11° and 12° of latitude, with an elevation of from 8 to 9000 feet, afford every variety of climate for the products of more northern climates. Somewhere in their vicinity, I have no doubt, the Cinchona or Peruvian bark might be successfully cultivated.

The situation of Calcutta, nearly on the tropic of Cancer, affords an admirable site for a great proportion of tropical plants, while its northern situation enables it to support many of the products of the temperate

zone, though it is hardly to be hoped, that much success will attend the attempt at naturalizing the plants of European climates. The richness and variety of the Calcutta Botanic Garden are however a sufficient indication of the eligibility of its situation.

It is singular, and at the same time most fortunate, that nearly at the most northern limit of the British territories, and in one of the most eligible situations for the purpose, a public garden should have been established by the native Governments which preceded the British. Zabita Khan first appropriated in 1779, the revenues of seven villages, for the maintenance of this garden. Gholām Kádir, as well as the Mahratta power after him, continued the same revenue until the time of Bapú Scindia, who reduced the establishment, allowing only the revenues of two villages, with that of a third held in *mudut mash.* The Marquis of Hastings, with the enlightened views of a statesman, determined on his visit to the Upper Provinces, that that which was intended only for the gratification of an Asiatic sensualist, should contribute to the advancement of science, at the same time that it increased the comforts of the people, and administered to the tastes of the most civilized European. The establishment was accordingly ordered to be formed into a Botanic Garden.

The situation of Seháranpúr, in point of latitude, elevation, vicinity to the hills, the nearness of water to the surface, and now the facility of irrigation from the Doab canal, makes it particularly eligible for the purpose. The parallel of latitude of 30°, or that which nearly passes through the Seháranpúr Garden, embraces in its course a greater variety of interesting country than perhaps any other; and as temperature is dependent upon latitude, and may be deduced by a formula, simple and sufficiently accurate for practical purposes, it follows that the vegetable productions in the neighbourhood, at least of the above parallel, will bear a considerable resemblance to one another; for it is well known, that the vegetation of each country depends upon its climate; and that plants of one country will easily grow in another which possesses a similar climate. Before proceeding, it may be useful to indicate, that the above parallel, or that of 30°, leaving India, passes through Persia, Arabia, and Egypt, and over the southern boundaries of Libya, Barbary and Morocco, across the Atlantic, through New Orleans, between Old and New Mexico, and passing the Pacific Ocean, crosses the very centre of China and Thibet.

An analogical comparison of the climate and botany of these various countries would lead into too much detail for the present

occasion; but that the object is not visionary of introducing into one country the useful productions of another which approximates in climate, or possesses a similarity in vegetation, may be inferred not only from the success which has already attended the efforts to introduce the useful productions of other countries, but also from the fact that the more valuable indigenous plants of India have already been transferred to and cultivated in countries, which possess many valuable productions peculiar to themselves.

As instances of the interchange, which has already taken place in the useful productions of the old and new world, I have prepared the following lists, to the second of which I have added a few plants which have become so common as to be thought natives of India, together with some others sent up from the Calcutta Botanic Garden, which have become perfectly naturalized in the Seháranpúr one.

Plants Introduced

From Asia, chiefly India, into America.	*From America into India.*
The Vine.	The Potatoe.
Rice.	Tobacco.
Ginger.	Pine Apple.
Coffee.	Guava.
Cinnamon.	Capsicum.
Pomegranate.	Carica Papaya.
Lime.	Achras Sapota.
Citron.	Annona Cherimolia.
Orange.	Logwood.
Sesamum Orientale.	Mahogany.
Cassia Fistula.	Parkinsonia Aculeata.
Eleusine Indica.	Argemone Mexicana.
Melia Azedirach.	Cerbera Thevitia.
Cytisus Cajan.	Allamanda Cathartica.
Coriandrum Sativum.	Asclepias Curassavica.
	Martynia Diandra.
	Canna Glauca.
	Jatropha Multifida.

The Sugar-cane, Indigo, and Tamarind are supposed by many to have been introduced from India into the new world; but as the subject is doubtful, I have preferred omitting them in the above comparison.

Besides the latitude and elevation, which is 1000 feet, the climate of Seháranpúr is particularly favourable for the introduction into India of the plants of more temperate countries; as the temperature for nearly six months in the year is sufficiently European, for the easy cultivation of most of the annuals of that part of the globe, while the cold is not sufficiently great or long enough continued to destroy the plants of more southern countries, with the exception of only such tropical ones as cannot bear any frost.

Though they may be sown earlier, the best crops of European vegetable and medicinal plants are those obtained from seed sown in November. After which, the weather becomes steadily colder until Christmas, when some heavy rain usually occurs, but which is sometimes deferred to a later period. During this season, the growth of perennials is stopped, as well as of the herbaceous plants of warm countries. In March, a rapid rise takes place in the mean temperature of the month, and the increase amounting to 12° is a sufficiently powerful stimulus to rapidly accelerate the vegetation of the spring. About the beginning or middle of April, the hot winds begin to blow, and continue to do so until the middle of June, when the rainy season commences, and according as it terminates towards the beginning or end of September, depends the late or early diminution of temperature which ushers in the cold weather.

A general idea of the temperature of the different months at Seháranpúr may be obtained, by a reference to the following abstract of the meteorological observations which I have made, and the results will serve as points of comparison with the mean temperature of other countries of which we wish to acclimate the productions.

The mean temperature of the year at Seháranpúr is about 73°, and of the months of

Jan.	Feb.	Mar.	April	May	June	July	Augt.	Sept.	Oct.	Nov.	Dec.
52°	55°	67°	78°	85°	90°	85°	83°	79°	74°	64°	55°

From the middle of October to the middle of April, the various useful and ornamental plants of European climates may be successfully cultivated; while the temperature of the other half of the year is suited for the cultivation of tropical products.

In introducing the productions of other, particularly temperate, climates, considerable advantage has been derived from having at command the climate of the hills, of which the temperate months occur at different seasons of the year from those in the plains: as is well known, but may be exemplified in the following table.

The mean temperature of the year at Masúrí is about 57°, and of the months of

Jan.	Feb.	Mar.	April	May	June	July	Augt.	Sept.	Octr.	Nov.	Dec.
42°	45°	53°	59°	66°	67°	67°	66°	64°	57°	50°	45°

The season for cultivation in the Masúrí climate is from March to October. Hence by taking advantage of the different months adapted for cultivation in the hills and in the plains, a complete year of moderate climate may be obtained for the germination of the seeds, and for the growth of the plants of the temperate climates of every part of the globe. Thus

At Seháranpúr in					At Masúrí in						
Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Augt.	Sept.	Oct.
64°	55°	52°	55°	57°	59°	66°	67°	67°	66°	64°	57°

In this way, a year with a mean temperature of 60°, of which each of the months is temperate, may be obtained, and seeds sown at one or the other, during the whole twelve months. Many plants have actually been thus introduced and preserved, which if confined to either would, while young, have been destroyed by the hot winds of the plains, or killed at Masúrí by the frosts of winter.

The garden having now been established for several years, during which it has both advanced and retrograded, it may be useful to indicate the progress it has actually made, both as a scientific and as an useful institution. A few words may, therefore, be well devoted to an account of its internal arrangement.

The garden contains 40 acres of ground; a sum of 200 rupees is allowed for its monthly expences. The establishment consists of 40 men, which, with the assistance of some convicts, carries on the several duties of the institution. By comparing the plan of the garden, as it was in 1823, with that of its present state, it will be observed, that a good deal of new ground has been enclosed, and many alterations made in laying out the grounds. In these the English style of gardening has been as much as possible adhered to; but previous to this being effected, many preliminary labours were required to be gone through.

In the first place, all the new and many of the old parts of the garden were cleared of jungle, and every where thinned of exuberant vegetation. The surface was levelled or sloped, as well to improve the general effect as to prevent the lodgment of water, which was conducted by drains into neighbouring rivulets. On either side of the boundary ditch, a hedge was planted; new gateways built, and a free communication effected with every part of the garden by a se-

ries of new roads; additional wells were sunk, and the Persian wheel introduced; but the latter have, in a great measure, been superseded since the opening of the Doab canal, from which a cut runs through the garden, and much facilitates the almost constant irrigation which in some seasons of the year is indispensable to the existence even of herbaceous vegetation in the Upper Provinces. A conservatory was built, where the plants of warm countries might be placed, so as to be protected from the frosts of winter, and those introduced from the hills equally saved from the scorching effects of solar radiation during the months of hot weather. Two tanks, one rather a large piece of water, have been formed, which, contributing to the picturesque beauty of the garden, serve also for the introduction of aquatic plants. The parts not in cultivation, after being ploughed and smoothed, were laid in grass. The cultivated parts, as well as the borders of the roads, were trenched to the depth of two feet, by which means the clayey substratum became well mixed with the sandy surface, when the whole was enriched with the addition of vegetable and animal manure. The borders of the roads were planted with different varieties of trees, flowering shrubs, and herbaceous plants, the latter in front and opposite to the vacancies of the rear lines, by which means a view of the plants in the latter was not obstructed by those in front. It may perhaps not be uninteresting to remark, that some English tools were introduced, and the use of wheelbarrows made general.

In order to insure due attention being paid to the several objects contemplated in the institution of the garden, it was divided into several departments. In one, plants were arranged according to the Linnæan system of classification, though now it would be preferable to change it for the natural method; another was devoted to agricultural experiments, and a third for horticultural purposes. Of the plants introduced from the hills, some are planted in nurseries; others in an artificial rock-work; and some in flower-pots in the conservatory; but in all the soil requires to be enriched hy the addition of decayed vegetable matter. Nurseries were likewise formed for fruit and ornamental trees and shrubs, for general distribution. A portion of the garden was allotted for the experimental medicinal garden, and another as a nursery of timber trees for the Dehlī and Doab canals.

For a furtherance of the objects of the institution, as a scientific one, pains were taken to obtain a knowledge of the Botany of the surrounding country: a catalogue was made of the plants which the garden contained, parties were sent out in every direction to bring in such as the garden did not contain, and those extended their

labours from the neighbouring hills into the Deyra Dún, and from that into the Himalayan mountains, and even into Kashmír.

The collections, as may be seen by the accompanying abstract of the catalogues, consist of upwards of 4000 species, and probably amount to about 30,000 specimens, independent of a complete set left with my successor Dr. Falconer, at Seháranpúr.

These have been chiefly collected in the northern provinces of India, but contain of course specimens of the plants which have been sent from the Calcutta to the Seháranpúr Botanic Garden.

In the northern provinces I include specimens of the plants indigenous in the tract of country running along the Ganges and Jumna from Allahabad up to the Satléj, with those growing on the low range of hills which skirt the Himalaya, as well as those of the Deyra Dún. Among those of the two latter tracts are many more of a European than an Indian type. Another series consists of plants of that part of the Himalayan range extending from the plain to the sources of the Ganges and Jumna, and included between the former river to the east and the Satléj to the west. A third series consist of plants from Kanáwar, or the tract of country lying along both sides of the Satléj within the British territories, but beyond the snowy passes of the Himalaya; but the most interesting collection is perhaps that which has been obtained from the valley of Kashmír and the mountains in its vicinity and on the road leading to it.

These collections have been formed since 1824, as previous to that the garden itself required for its internal improvement and management the labours of the whole establishment. In 1825, I first endeavoured to get a collection of specimens from Kanáwar, but the gardeners whom I sent unfortunately ran away, but the late Lieutenant Maxwell, of H. M.'s 11th Dragoons, who had promised to look after them, brought down a collection of about 100 species, nearly the whole of which were new. A much larger collection has been obtained in 1831.

The plants from Kashmír were first procured in 1828, by sending two of the gardeners belonging to the Seháranpúr establishment along with the northern merchants who bring down fruit, &c. for sale. In the following year or 1829, the merchants themselves brought me down a number of dried specimens in a book which I had given them for the purpose, but these were generally duplicates of the former year. Last year I again sent two of the establishment, but they brought but an indifferent collection in point of numbers, though the specimens were generally large and well dried. By these means I also obtained living bulbs of the Saffron of commerce, as well as of the plant furnishing the

true salep misrí, and along with the former in 1828, living plants of the fruit trees of Kashmír, most of which are now thriving in the garden at Masúrí. Among these are the apple, pear, peach, nectarine, plum, cherry, walnut, and vine.

The whole of the plants of the herbarium have been arranged in two catalogues, one according to the Linnæan or artificial classification, and the other according to the Juissieuan or natural method. To the botanical names, the Hindústaní ones are added, together with the place of growth, time of flowering, of ripening of their seed, with notices respecting such as are applied to any use. In an appendix, all the plants which are known to be useful in agriculture or medicine, or which afford timber, materials for rope-making, or the tanning principle, or resin, gum, oil or fæcula, are enumerated in separate lists.

Of many of the new plants, drawings have been made by the painters attached temporarily to the garden.

As exemplifications of what has already been effected in the naturalization of plants, and as guides in the course which it would appear proper to follow, it may be useful to indicate some of the plants of the different countries, which have already been naturalized in the open air, in the Seháranpúr garden.

Among the plants of more southern latitudes, for which the cold of the Seháranpúr climate is not too severe, may be enumerated, along with such common fruits as plantain, shaddock, custard apple, and jack fruit, the cinnamon and sweet laurel, great dillenia, species of anona, uvaria, pterospermum.

Of those from more northern climates, such as Kábul and Kashmír, for which the parching heats of May and June, and the tepid moisture of the rains have not been so unfavourable, but to allow of their naturalization in the Seháranpúr climate, may be mentioned the almond, peach, nectarine, plum, pomegranate, walnut, quince, saffron, henbane, atropa physalodes, clover, vine, apple, species of sage, of pink, of centaurea, aster, balsam, rhubarb, iris, polemonium.

But the greatest variety of plants which have been acclimated are those which have been procured from the hills, and this does not proceed from their more easy naturalization, but from the greater facility of communication; for the differences between the climate of the hills, and that of the plains, is much greater than occurs in places differing only in latitude; for not only the temperature of the atmosphere is different, but also its pressure and density, as well as the radiation of light, and the variations between dryness and moisture. But here the

success has been so complete in so many instances, that, within certain bounds, hardly any difficulties appear insurmountable.

Trees.		Flowers.		Fruits.	
Oak.	Horse Chesnut	Primula.	Delphinium.	Myrica Sapida.	Cherry.
Fir.	Blackthorn.	Viola.	Aconitum.	CoriariaNepalensis.	Apricot
Dogwood.	Juniper.	Clematis.	Thyme.	Berberis Asiatica.	Pear.
Maple.	Yew and Box.	Anemone.	Gentian.	——— Aristata.	Apple.
Service tree.	Buckthorn.	Potentilla.	Hypericum.	Juglans Regia.	
Holly.	Spindle tree.	Geum.	Spiræa.	Rubus, 3 sp.	

As the climate of the hills bears the nearest resemblance to that of European countries, the transition is easy, from a consideration of the former to those of the latter; and the success would, I conceive, be most extensive, but in this place so remote from the sea, the means of obtaining European plants are few, and seeds in a vegetative state arrive but seldom: but the introduction of the various European kitchen vegetables, the naturalization of many of the flowers, and the successful cultivation of many medicinal plants, afford the most rational prospect of the eventual success being only limited by the means afforded of insuring it. The horticultural catalogue exhibits the names of the several vegetables which are successfully cultivated in the Seháranpúr climate. The medicinal one will point out others, while among flowers may be enumerated sweet brier, wall flower, heart's ease, several snapdragons, mignionette, mallow, &c.

In proceeding westward, in the latitude of Seháranpúr, the first countries of which it would be desirable to acclimate the productions are Persia, Arabia, and Egypt; and as there is considerable resemblance between their Botany and that of the Upper Provinces of India, and as some of their fruits have already been introduced, while others, as well as many of their vegetables and useful productions, are the same as those of India, I have no doubt, that a considerable proportion of their valuable products, as asafœtida, ammoniacum, myrrh, galbanum, &c. might be naturalized at Seháranpúr, where the coffee tree flourishes, and the senna is produced in the fullest perfection.

In examining the genera in Pursh's Flora of North America, and those of Mexico, in Humboldt's Synopsis, a very considerable resemblance will be found to exist with those of the Seháranpúr catalogue, of which the plants are chiefly such as are indigenous near Seháranpúr, or in the hills: hence it may reasonably be concluded from this Botanical analogy, similarity of temperature, and in one case from identity of latitude, that little difficulty will be experienced in cultivating the useful productions of both countries, either in the Seháranpúr or Masúrí

garden, particularly as such plants as have been hitherto introduced have succeeded remarkably well. Among these may be enumerated the mahogany, logwood, sapota, cherimolia, ash-leaved maple, pimento, dahlia purpurea.

The plants of China, which have succeeded in the Seháranpúr Garden, and are now in a flourishing state, are the litchee, loquat, wampee, longan, flat peach, and digitated citron, spiræa corymbosa, dianthus chinensis, rosa chinensis, and althæa rosea. The numbers are few, but they are all that have been introduced, and now appear so perfectly naturalized as to excite the wish to make a more extended trial, and to attempt the cultivation of the tea plant, of which the geographical distribution is extended, and the natural sites sufficiently varied to warrant its being easily cultivated.

The countries in the southern hemisphere, which have the nearest approximation in latitude and temperature to northern India, are the Cape of Good Hope and New Holland: the most populous parts of both are about the 34th parallel of latitude. Though the Botany of each is distinguished from that of the other by possessing a number of genera peculiar to itself, yet is there the closest affinity between that of the two countries, and a marked difference from that of every other. Though they possess but few plants in common, we must not from this circumstance conclude that the plants of the Cape and New Holland will not succeed in India; but rather take into consideration, that as there is a similarity with its northern parts in point of latitude and temperature, and as they have possessed themselves of every species of vegetable and fruit tree known in other parts of the world, some of which are natives of and the greater number flourish in India, so their own peculiar or useful productions may no doubt be as easily transferred to the latter country. Of those which have been attempted, the success has been complete, as of the aloes, pelongenium (geraniums), slopelias, amaryllis, casuarina, cajaputi.

A view having been given of what has been effected by the Seháranpúr garden in Systematic Botany, as well as for the naturalization of plants, it remains to show, that the third branch, or that of Applied Botany, has not been neglected.

In the agricultural department less has been done than might perhaps have been effected, but here the difficulty to be contended with is the want of a population ready to take advantage of any novelties that might be introduced; still much good might be effected by introducing improved kinds of the seed which the natives themselves are in the habit of sowing. The agricultural division of the catalogue before alluded to

shows the number of plants from which the natives of India derive the means of increasing the supply of food. The *rabí* crop is sown about November, and reaped in April, while the *kharíf* crop is sown in June, and cut in October.

As instances of what may be effected, it may be noticed, that the barley of the hills called *ooa*, from an elevation of 10,000 feet, has become naturalized in Seháranpúr; and a singular species of wheat from Kanáwar, at an equal elevation, succeeds remarkably well. Of plants affording fodder for cattle, which have been introduced, and are in a thriving state, Guinea and Fiorin grasses may be noticed, as well as lucerne, soccory, and clover. All have become naturalized, and the three latter are valuable as affording green food when there is little or no grass in the country.

The Horticultural catalogue exhibits a large proportion of the plants used as vegetables both in European and Indian climates. Of the former most have been introduced since the British reign, many by means of the garden; and of native vegetables, pains have been taken to bring together those which are common in different parts of the country. The list of fruit trees displays, collected in one place and naturalized in the open air, the various fruit trees of very different countries, as of India and China, Kabúl, Europe, and America. A view of the list of annuals and of flowering shrubs will prove the variety which are always ready in the different nurseries for general distribution, and of which as well as of fruit trees many thousands are yearly distributed, together with packets of seeds, to all those who are inclined to send for them.

In the list of medicinal plants will be observed many which form the most powerful articles of the European materia medica, while others, perhaps not less valuable, are known only to native *hakíms*. So much time has been occupied in preliminary investigations, that it is not easy to give an idea of the results that may finally be obtained. But it may at present be stated in general terms, that the materia medica in use among the natives of India is very extensive in the number of its articles; and which, according as they have derived their knowledge from the Greeks through the Arabs and Persians, or from the Hindús, are the produce of both European and Asiatic countries. To one unacquainted with the subject, it will appear surprizing to be told, that the natives are in the habit of administering, or rather of prescribing such medicines as hemlock, hellebore, henbane, and colchicum.

Having derived much of their knowledge of medicine from the Greeks, they are naturally anxious to prescribe that which they find

praised in their works; but as most of the articles are of European growth, the distances which they have to travel is great, and the adulterations proportionally numerous: the natives, both physicians and patients, being too ignorant of the original article to be able to detect the falsification. As considerable anxiety however is now displayed, and expence incurred by the Government in the instruction of native doctors for the public service, the benefit of which must eventually extend to the class of practitioners who administer to the mass of the population, it would appear the part of a wise and provident foresight, that as a more correct knowledge of medicine is imparted, and the art of detecting the impostures in drugs is acquired, means should be adopted of more genuine articles being provided. This might be effected by first investigating the true value of genuine Indian medicines, and then naturalizing in the hills or plains such articles as they are deficient in, or which are now of foreign growth.

That the success would be considerable, I feel warranted in assuming, from the results of the experiments I have already made, even in introducing medicines for the use of the public service, which have borne the test of comparative trials with the best from European depôts. The difficulties to be surmounted may not be so obvious, except to those who have made similar attempts; but if it be considered that not only the seed or plant is first to be procured, then grown with all the care of an exotic, extended into a crop, and converted into a form fit for exhibition as a medicine, then proved equal in medical virtue and at the same time cheaper than those already in use, the attempt will not appear so easy; particularly if it be remembered, that not an oil can be distilled, without first making a still, nor an extract prepared without first constructing an apparatus for expressing the juice, and then evaporating it to a proper consistence in an apparatus of steam.

Among the articles which have been introduced and reported upon by Mr. Twining*, after experiments made at the General Hospital, it appears, that "the cultivation of rhubarb at the Masûrí Tabba, is expected to afford a very valuable remedy, which is less disagreeable to take than the best Turkey rhubarb, nearly equally efficacious as a purge, and very superior in small doses as a tonic and astringent in profluvia;" and Mr. Twining concludes his report with saying, that "the acquisition of this remedy to the materia medica of this country will be of the utmost importance." The medicine has been introduced, and

* Mr. Twining's experiments, on the Rhubarb of the Hills, and the Senna and Henbane grown at Seháranpúr, are published in the 4th and 5th volumes of the Transactions of the Medical Society of Calcutta.

considerable quantities supplied to the depôts. The oil of turpentine distilled from the turpentine of the common long-leaved fir is considered, in a letter from Mr. Hutchinson, to be of "very superior quality." The extract of henbane has been pronounced by many, from its freshness, to be superior to that imported from Europe, and by Mr. Twining to be of "most excellent quality." It has been sent to Madras, and the supply discontinued from Europe, regular supplies being annually furnished to the depôts. Senna has only this year been introduced into practice. The Medical Board, after the trials made at the General Hospital, express their gratification at the result, and direct that its cultivation be extended as much as possible for the public service. Mr. Twining pronounces the senna cultivated at Seháranpúr very superior to that commonly supplied for Hospital use, possessing in a high degree the peculiar aroma of the best senna, and after 45 trials, considers it equal to the best senna he has ever seen. The other articles which have been cultivated or prepared for Hospital use will be exhibited in the catalogue which forms an appendix to the report*.

In considering the cultivation of medicines in India in an economical point of view, it may be safely assumed, that by cultivating a sufficient number of articles to keep in full employment whatever establishment may be entertained, a very considerable saving will eventually be effected; for the cost of the production of medicines must, like every other product of the soil in India, be less than can be produced in and exported from Europe, particularly if some machinery be employed for the grinding of powders and the expressing of oils and extracts, and this might easily be done by the water-mill in the garden.

Though the subject would not be less interesting, it would lead into much too extended detail to enter particularly into the economical purposes to which the various products of plants are applied. But it may be mentioned generally, that there are few of the principals of plants which form the subject of vegetable chemistry, which are not produced by the plants introduced into the Seháranpúr garden, as will be seen by the various lists which form the appendix.

Among the timber trees, the teak, saul, toon, sissoo, seriss, maple, casuarina, bamboo, jamún, mulberry, may be mentioned; as of these many thousands are furnished annually, to be planted along the banks of the Doab canal. One of the subjects, to which attention might be beneficially turned, is that of finding efficient substitutes for, or actually

* The above account formed the substance of a report to the Right Honourable the Governor General, on his Lordship's visit to the garden in 1831.

cultivating the hemp, as during the war, when the usual supplies were cut off, it was proposed to grow it in large quantities in this country, and Dr. Roxburgh made numerous trials on the comparative strength of the several articles employed by the natives in India, and proposed that hemp should be cultivated in large quantities in the Upper Provinces. This was before it was known, that some of the finest hemp in the world is to be found in the hills, where it is already employed by the natives for making ropes to cross their rivers, and for the manufacture of a coarse cloth much valued in the plains. The most beneficial results might also be obtained by the introduction of better kinds of cotton seed for the cultivation of superior kinds of cotton. Attempts have been made with two species, the one an American, and the other an indigenous perennial species. Samples of both were sent to Mr. Saunders, who pronounced the staple of the former to be better than that of specimens sent of cotton commonly cultivated in this country, which he however considered of very excellent fabric; but the cotton of the perennial species, or gossypium arboreum, he thought the best description of cotton, the fabric and staple being both good.

As useful in the different arts, it may be mentioned that a very excellent *resin* is produced by the saul tree, while a variety of *gums*, which likewise form articles of commerce, are produced by several trees from the lower hills now naturalized at Seháranpúr. The fine sugar for which the Seháranpúr district is remarkable, is chiefly refined with the *mucilage* of two plants, kydia calycina and hibiscus abel-moschus. In the subjoined lists are shown the plants used as *dyes*, as well as those which afford materials for the *tanning* of leather. Among those which afford *fixed oils* are some of which advantage might be taken to supply excellent substitutes for the olive oil now imported from Europe. The apricot oil sent down to Calcutta was highly approved of. Of plants affording *saccharine matter*, it is needless to speak, as sugar is so abundant, and with very little trouble might be manufactured of very superior quality. *Fœcula or starch*, besides forming a principal part of the several grains, abounds in many tuberous roots, of which the peculiarities have been hitherto uninvestigated: very excellent *salep* has been made from some of the Orchis tribe, and *jelly* is afforded by a variety of plants.

The unaccountably little attention which has hitherto been paid in India to vegetable chemistry* must account for the want of precision

* The analysis by Mr. Piddington of the Rohana bark, Swietenia febrifuga, published in the 5th volume of the Transactions of the Medical Society, is an useful indication of what may be effected by attention being turned in this direction.

in our knowledge respecting the vegetable products of India, as well as our ignorance respecting the nature of the acids furnished by different vegetables. I have no doubt that both Tartaric and Citric Acids might be manufactured, while of Alkalies, both Potash and Soda exist in every bazar, and require only purification to be fit for every purpose.

From the above enumeration, it is hoped it will appear that endeavours have been made to make the H. C.'s Botanic Garden contribute to the progress of Botanical Science, at the same time that it has been made practically useful in distributing to the surrounding provinces plants both of a useful and ornamental nature.

As the situation was favourable, and little is known of the Natural History in other departments of the northern provinces of India, collections have been made of the skins and bones of mammalia; of stuffed specimens of birds; of insects, as well as of other branches of Natural History; together with a collection of articles used as medicinal agents in the north-western provinces, and a series of geological specimens of the parts of the hills I had an opportunity of visiting.

Contents of the Herbarium, arranged according to the natural families.

1. VASCULARES. 1. DICOTYLEDONES. 1. *Dichlamydeæ.*

Thalamiflorœ.

1	Ranunculaceæ	13	85	30	Temstræmiaceæ	2	2
2	Dilleniaceæ	1	1	31	Camellieæ	1	1
3	Magnoliaceæ	3	4	32	Olacineæ	1	1
4	Anonaceæ	3	7	33	Aurantiaceæ var. 31	7	12
5	Menispermaceæ	4	11	34	Hypericineæ	2	12
6	Berberideæ	1	5	35	Guttiferæ	2	4
7	Podophyllacæ	1	2	37	Hippocrateaceæ	1	1
8	Nymphœaceæ	3	8	37½	Dipterocarpeæ	1	1
9	Papaveraceæ	3	8	39	Malpighiaceæ	3	4
10	Fumariaceæ	3	15	40	Acerineæ	2	5
11	Cruciferæ		98	41	Hippocastaneæ	1	1
12	Capparideæ	4	9	43	Sapindaceæ	6	8
13	Flacourtianeæ	1	3	44	Meliaceæ	3	7
14	Bixineæ	1	1	45	Ampelideæ var. 28	3	18
16	Violareæ	1	6	46	Geraniaceæ	3	13
17	Droseraceæ	2	2	47	Tropæoleæ	1	1
17½	Resedaceæ	1	3	48	Balsamineæ	2	9
18	Polygaleæ	1	7	49	Oxalideæ	3	4
20	Pittosporeæ	1	1	50	Zygophylleæ	3	4
22	Caryophylleæ	12	62	51	Rutaceæ	4	6
23	Lineæ	1	5	52	Simarubeæ	1	1
24	Malvaceæ	11	59	53	Ochnaceæ	1	1
25	Bombaceæ	2	3	54	Coriariæ	1	1
26	Buttneriaceæ	8	11				
27	Tiliaceæ	3	22				566
28	Elæocarpeæ	1	1				

Calyciflorœ.

55	Celastrineæ	4	12
56	Rhamneæ	4	15
58	Samydeæ	1	5
62	Terebinthaceæ	13	29
63	Leguminosæ		354
64	Rosaceæ var. 107	20	105
66	Granateæ	1	3
68	Combretaceæ	5	7
71	Onagrariæ	5	23
74	Lythrariæ	5	10
75	Tamariscineæ	1	3
76	Melastomaceæ	1	2
78	Philadelpheæ	1	1
79	Myrtaceæ	9	15
80	Cucurbitaceæ	12	50
81	Passifloreæ	1	3
83	Turneraceæ	1	1
85	Portulaceæ	3	7
86	Paronychieæ	1	2
87	Crassulaceæ	4	16
89	Cacteæ	2	2
90	Grossulariæ	1	3
91	Saxifrageæ	5	19
93	Umbelliferæ		93
94	Araliaceæ	2	6
95	Lorantheæ	2	9
96	Caprifoliaceæ	5	23
97	Rubiaceæ	21	56
98	Valerianeæ	2	9
99	Dipsaceæ	3	10
99¼	Cichoraceæ		60
99½	Cynarocephalæ		59
99¾	Corymbiferæ		203
100	Campanulaceæ	4	17
102	Ericeæ	4	11
			1243

Corolliflorœ.

104	Symplocineæ	1	3
105	Myrsineæ	4	11
106	Sapoteæ	3	5
107	Ebenaceæ	1	3
108	Oleineæ	3	7
109	Jasmineæ	2	18
110	Strychneæ	1	1
111	Apocyneæ	15	25
112	Asclepiadeæ		35
113	Gentianeæ	9	52
114	Polemoniaceæ	1	1
115	Didymocarpeæ	1	7
116	Bignoniaceæ	1	5
116½	Sesameæ	4	7
117	Hydroleaceæ	1	1
118	Convolvulaceæ	7	40
119	Borragineæ	12	55
120	Sebestineæ	1	4
121	Solaneæ	10	33
123	Scrophularineæ	27	76
124	Orobancheæ	2	4
125	Pediculareæ	2	19
127	Labiatæ	38	124
130	Verbenaceæ	11	28
131	Acanthaceæ	8	56
132	Lentibulareæ	1	5
133	Primulaceæ	5	31
			656

2. *Monochlamydeæ.*

135	Plumbagineæ	1	1
136	Plantagineæ	1	9
137	Nyctagineæ	2	3
138	Amaranthaceæ	6	35
139	Chenopodeæ	9	23
140	Begoniaceæ	1	3
141	Polygoneæ	4	55
143	Laurinæ	3	14
146	Thymeleæ	1	5
147	Eleagneæ	2	4
148	Santalaceæ	2	2
149	Osyrideæ	1	1
151	Euphorbiaceæ	5	90
152	Resedaceæ	2	4
155	Urticeæ	4	27
156	Piperiteæ	0	0
157	Artocarpeæ	3	26
158	Ulmaceæ	1	3
159	Platanideæ	1	1
160	Amentaceæ	8	35
161	Coniferæ	8	19
			329

2. Monocotyledones.

162	Cycadeæ	1	2	180 Colchicaceæ	1 1
163	Hydrocharideæ	2	4	181 Pontedereæ	1 2
164	Butomaceæ	1	1	182 Commelineæ	2 9
165	Alismaceæ	2	6	183 Junccæ	1 8
167	Orchideæ		82	184 Juncagineæ	1 1
168	Scitamineæ	10	23	185 Restiaceæ	1 1
169	Musaceæ	2	4	186 Palmæ	7 10
170	Irideæ	3	9	187 Gramina	356
172	Amaryllideæ	6	12	188 Cyperaceæ	149
173	Hypoxidæ	2	4	189 Typhaceæ	1 2
174	Liliaceæ	6	12	190 Pandaneæ	1 1
175	Hemerocallideæ	2	2	191 Fluviatiles	2 7
176	Asphodeleæ	12	25	192 Aroideæ	4 14
176½	Bromeliaceæ	2	3	193 Saururcæ	1 2
177	Dioscorinæ	1	5	194 Piperiteæ	2 4
178	Smilaceæ	5	20		
179	Trilleaceæ	2	2		783

CELLULARES.

1. *Foliaceæ.*

1	Filices	17	111
2	Marsileaceæ	2	2
3	Equisetaceæ	1	5
4	Characeæ	1	1
5	Lucopodineæ	1	9
			136

2. *Aphyllæ.*

6	Musci		84
7	Hepaticæ	2	8
8	Lichenes		52
9	Fungi		39
			143

General Synopsis.

VASCULARES.	1. Dicotyledones.	1. *Dichlamydeæ*	Thalamifloræ 563; Calycifloræ 1243; Corollifloræ 656	2462
		2. *Monochlamydeæ*	329	2791
	2. Monocotyledones			783
				3574
CELLULARES.	1. *Foliaceæ* 136; 2. *Aphyllæ* 143			279
Plants unadjusted, collected between Delhi and Allahabad				250
Plants of which the natural families are unknown				61
Total number of species				4164

II.—*Further Illustrations of the Antilope Hodgsonii. By* B. H. Hodgson, Esq.

Having lately received two more stuffed specimens of the Chírú Antilope, these being the fourth and fifth which I have obtained in the last two seasons, I beg leave to send you the chief results of my examination of them, in emendation of, and addition to, the account of this animal with which I supplied you last year, and which you published in the Gleanings No. XXIII.

The average size of the mature male exceeds not 5 feet of length, from the tip of the nose to the end of the tail; nor two feet ten inches of height, at the shoulder. From the occiput to the insertion of the tail, $3\frac{1}{2}$ feet. Length of the neck 12 to 14 inches: of the head, 10 to 11 inches: of the tail $5\frac{1}{2}$ inches, without the hair; $8\frac{1}{2}$, with it.

The nasal tumours are natural formations, and not the consequence of disease, as had been suggested to me. I have lately examined them with care, and find them to be composed of firm, elastic skin and cartilage, like the nostrils, immediately behind the posterior boundary of which they are placed, and into which they open freely and obviously; being in fact a prolongation backwards, and an accessary dilatation of that reflexion of the skin which lines the nostrils. Externally, these peculiar formations present a round, firm, elastic swelling on each lip, well defined, and covered with hair, like the proximate parts. Internally, they constitute a sack, of capacity to hold a marble, lined with the same skin which lines the nostrils, and not communicating with the interior of the nose, except by and through the ordinary nostrils, into which the sacks open forwards by a slit that will admit the finger to be passed into it, and thence all over the interior of the sacks. These sacks or sinuses are usually defiled with mucus, secreted from the nose; and they seem to me (who am no anatomist) to be nothing more than accessary nostrils, designed to assist this exceedingly fleet animal in breathing, when he is exerting all his speed: for the expansion of the nostrils opens them also, and their elasticity allows of their being dilated in the manner of the nostrils. There is not the least appearance in the Chírú, either external or in the bones of the skull, of lachrymary sinuses: and the nose is ovine, that is, perfectly clad and dry, but with somewhat of the cervine breadth and bluntness of termination. The Chírú is a very compactly formed animal, standing high on the legs, and full of vigour, grace, and spirit.

The body is rather short and full: the neck of medial length and bowed in: the head, nor long nor short; of considerable vertical but rather small transverse dimensions, except between the orbitar ridges, which being very prominent, give to the head when measured between them, a good breadth: the forehead sub-convex: the nose slightly arched: the muzzle thick, dry, and hairy: the ears small, erect, pointed, naked within, having a small quantity of longish soft hair standing up around their orifices; fully clad without, in close short fur; no trace of striæ on their interval surface: the tail shortish, reaching to the buttocks only; rounded, tapered pretty fully, and uniformly covered with hair, of which that at the tip is a little prolonged, but not tufted: the limbs clean, long, slender, sinewy, covered, like the head and ears, with close fine fur of an ordinary stamp, and having no brushes on the knees: the pasterns, long and inclined: the hoofs finely formed, compressed and hard; before rather spread, and padded behind: the false hoofs, mere callosities, but large. The withers are lower than the croup; the back nearly straight; the hind limbs stooped; and the whole form, and accustomed attitudes, those of an extremely agile and swift animal.

The hair of the body in general is of exactly the same character with that of the Tibetan musk and Himalaya wild sheep, but considerably finer and shorter than the hair of the former, and rather finer and shorter than that of the latter. All three animals are similarly furnished with a sub-fleece of fine wool; which, however, is scanty in all, and most so in the Chírú.

The hair spoken of is harsh, but feeble and brittle; erect from the skin, very thickly set on, of a hollow quill-like feel and look, undulated throughout the greatest part, but the lips straight.

The wool is, in the main, closely applied to the skin. A small portion of it, however, insinuating itself between the interstices of the close set hair, passes up half way to its point. The wavy structure of the hair not only tends to keep the wool in close adaptation to the skin, but, by the manner in which the salient bends of one hair fit into the resilient curves of another, prevents as far as possible the access of cold air to the skin in all the various movements of the body.

The peculiar clothing of these animals is, in all its characteristic development at least, reserved for the cold season only; the hair being, in summer, of a nearly ordinary quantity and quality, and the wool then scarcely discoverable.

I have now by me the skin of a Chírú, the covering of which is so little peculiar that it might almost pass for that of any ordinarily coated animal of the Antilopine, or Cervine family. The head, ears, and limbs, are *always* dressed in fine close fur of a common kind; and the hair of the tail, though longer and looser, is of a like ordinary description. The rufous tinge upon the superior surface of the Chírú is apt to be superseded in age, by a hoary dull white, on the crown of the head, neck, and buttocks. The dark marks on the face and fronts of the limbs are not black, but dark brown; darkest in the oldest animals. The lower part of the forehead only, or more properly the face, is darkened, and not the forehead, at least never the upper part of it; and the stripes down the limbs depend for their full development on maturity, young animals wanting them more or less, especially on the hind legs above the hocks. The tail, on its upper surface, is always coloured like the proximate part of the back.

The special habitat of the Chírú is north-eastern Tibet, and he is never seen, except casually, so far west as Ladakh. He inhabits open plains exclusively, never frequenting either mountains or woods; or associating with the musks or wild sheep.

If therefore the Kemas of Ælian, is justly characterised as having a white tail, and residing in woods, the Kemas is not the Chírú, as Major H. Smith surmises it to be. The drawings and technical description of the skull and horns of the Chírú annexed (pl. IV.) will I think suffice to prove that the Chírú's horns are not set on "parallel to the plane of the face," according to the same able author's statement. Whether or not the horns rest on the "crest of the frontals," I cannot say; not precisely understanding the expression. But I fancy this must be a mistake; since the horns quit the forehead *between* the orbits and not *behind* them; and the frontal bones, continued behind the horns, are considerably higher *there* than where the horns rise from them.

I have taken peculiar pains in ascertaining the habitat of the Chírú, and have no doubt, now, that the species frequent the *open* plains of north-eastern Tibet, exclusively. Nor do I see any reason to distrust my present information, that the species is very gregarious, and that the females have no horns.

By the sinuses within the osseous cores of his horns, and by the signal compression of their bases, the Chírú is related to the genus Capra, as also, by the partial and peculiar development of the annuli. We might add, as additional features of resemblance, the total absence of the lachrymal sinuses and the dry muzzle. But here the

slender analogy must be dropped: for, the Chírú has the graceful proportions proper to the Cervine race of Ruminants, and is not inferior in speed and elegance to the finest of the Antilopes, to which last intermediate genus, half Cervine, half Caprine, he belongs.

After a careful comparison of the indicative characters of Major H. Smith's several groups of the Antilopidæ, I am of opinion that the Chírú ought to be referred to the Gazelline group. As already mentioned, I am now satisfied that the species is gregarious, inhabits open plains, and has no horns in the females. Whether either sex has inguinal pores, and the females 4 or 2 mammæ, are points still undetermined. This Chírú must belong to one of the four following groups of the able author just mentioned: The Orygine, the Reduncine, the Gazelline, or the Antilopine. By the want of the following marks of the Orygine group, I presume it cannot be referred to that: High shoulders; large stature; long ears; a long tufted tail; a mane; horns parallel to the face; non-gregarious habits; horned females. With respect to the Reduncine division, the Chírú has none of the subjoined characters of it. Horns short, rounded, annulated less than half way up, and set on behind the orbits; ears large and open; fur long and loose; tail with the hair directed towards the sides; shortish thick limbs; residence on rocky mountains, or under cover of reeds or bushes; non-gregarious habits.

There remain only the Gazelline and Antilopine sections to choose between; and the preference is perhaps due to the former, as having more equivocal suborbital sinuses, and ovine nose. It must be confessed however that the *total* absence of lachrymal sinuses, united to an ovine nose, and horns turned forwards, in the Reduncine group, afford strong grounds for referring the Chírú to it; grounds which would have decided me in favour of that group, had I not been informed that such apparently permanent and immutable characters as the two former, are nevertheless dependant on climate.

Upon the whole, I refer the Chírú to the Gazelline group, chiefly because it is very gregarious, dwells in open plains, and has limbs of the finest mould. I would observe by the way, that these long slender limbs terminating in hoofs, the posterior part of which is somewhat dilated and padded, offer strong presumptive proof of the truth of the asserted residence of the species in open bare plains with a sandy soil, such as all the plains of Tibet have.

Dimensions and character of the Skull and Horns of the Antilope Hodgsonii.

The length of the skull, from the symphysis of the intermaxillary bone, to the superior edge of the great occipital foramen, by a line passing along the frontal and sagittal* sutures, and continued down the middle of the occiput, is 1 foot $1\frac{7}{8}$ inches.

From the extremity of the nasal bones to the central point of their insertion with the frontal, $3\frac{1}{8}$ in.; from the commencement of the frontal suture to its junction with the coronal, $3\frac{1}{4}$ in.; thence to the bambdoidal suture $1\frac{7}{8}$ in.; thence to the transverse crista of the occiput, 1 in.; thence to the edge of the foramen magnum, $1\frac{1}{8}$ in.

The utmost height, or vertical dimensions of the skull, from the ridge of the parietal to the lowest edge of the ramus of the jaw, $6\frac{1}{8}$ in. Utmost breadth of the skull, across the malars and before the orbitar ridges, 3 in.

The orbits are placed laterally, with a decided obliquity forwards and outwards, and consist of very firm and complete bony circles, which are open behind to the temporal fossæ, as usual. The nearest interval between them measures $3\frac{1}{4}$ in. the widest and posterior interval $4\frac{7}{8}$ in.

The core or osseous nucleus of the horns has a large oval cavity, communicating by one clear canal with the frontal sinus.

The cavity has nothing porous or cellular about it; but is a perfect, smoothly-walled, sinus, partly excided from the frontal bones, and partly from the pedicular or basal portion of the horn's core.

It is $\frac{7}{8}$ of an inch broad and $1\frac{1}{8}$ inch high; and from the anterior and inferior edge of it is opened the canal communicating forwards. This canal, like the greater cavity, is smooth-walled, and free from cellular partitions. It is of an uniform cylindrical shape, with the diameter of a crow's quill. At the forward end it throws off a duct opening into the frontal sinus, and then proceeds to communicate with the nose, by means of 3 or 4 cellular perforations in this the anterior extremity of the canal or tube, and where alone there is the least appearance of cellular formation, either in the canal, or in the great cavity above it.

The bony nucleus extends about $\frac{2}{3}$rds up the horns, or as far as the annuli, and is of a remarkably compact and hard structure, towards their bases; more fibrous and soft, towards their tips.

As I have spoiled a beautiful skull to ascertain these facts, I must crave permission to say, scepticism avaunt!

* *i. e.* by a line best so defined, for of course the sagittal suture exists not.

There are two species of Antelope* at least, besides the Chírú, wanting that solid character in the nuclei of the horns, which has heretofore been held to be so essentially indicative of the genus.

The frontal processes take their origin from the frontal bone at the distance of three quarters of an inch from the apices of the nasal bones, anteriorly; and half an inch from the proximate point of junction of the frontal and parietal bones, posteriorly: laterally, their distance from the orbitar ridge of the temporal bone is $\frac{7}{8}$ of an inch; and from the proximate point of the frontal suture $1\frac{1}{8}$ths of an inch. The basal interval of the frontal processes, or *unsheathed pecicular* portion of the long nuclei, is rather more than $\frac{1}{2}$ inch: their circumference, pretty close to the base, $4\frac{3}{8}$ inches; and their height, from the adjacent part of the orbitar arch to the commencement of the horny sheath, $\frac{1}{2}$ an inch.

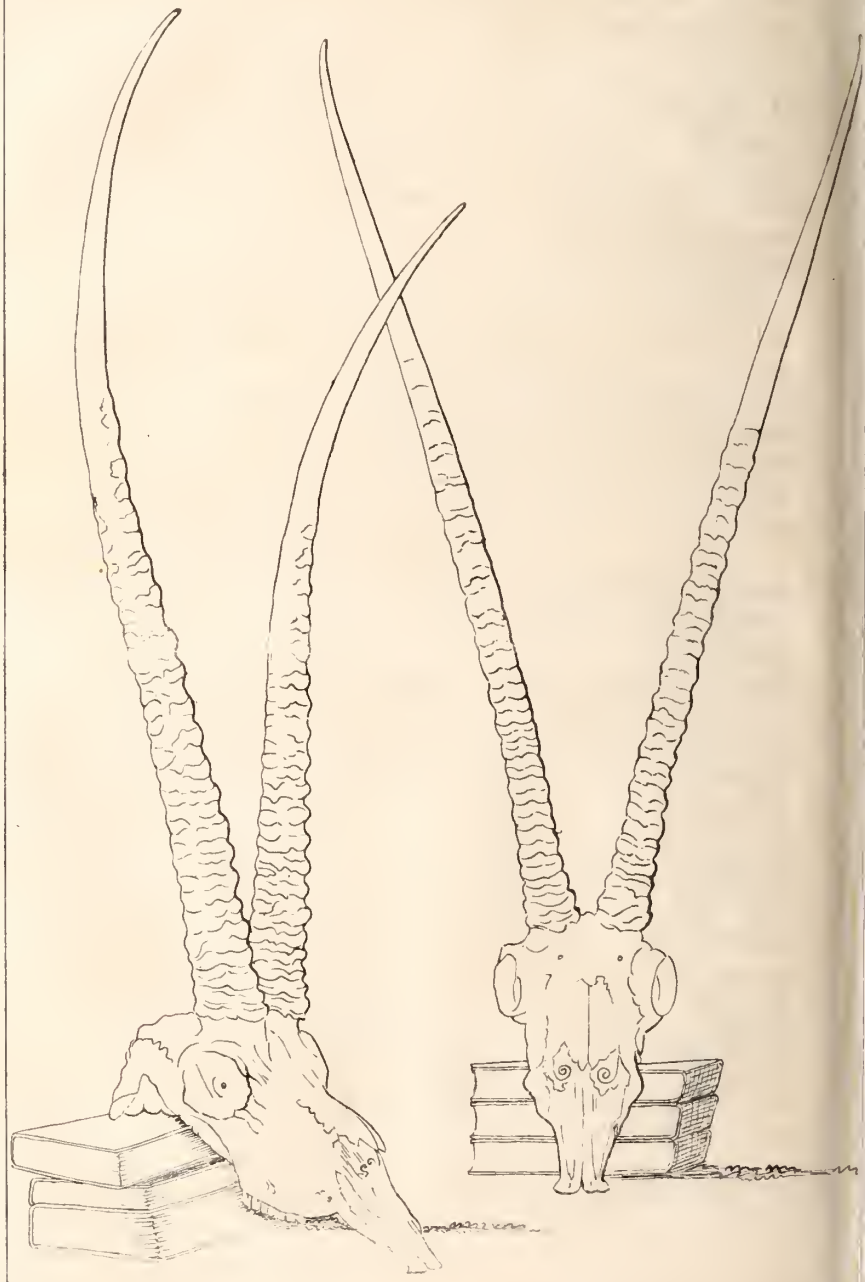
The frontal processes proceed from the forehead, above and between the orbits, with a slight inclination outwards and backwards —so slight, however, that the long horns which they support assume very nearly an erect position in the natural state of the animal: and it is the outward, not the backward inclination, which prevents one from justly characterising the horns as vertical.

The occipital bone forms the posterior boundary of the skull, with the exception of the triangular portion, on which arises the crista occipitalis; and this portion is locked between the ends of the parietal bones, and is situated *superiorly*. The occiput then proceeds almost perpendicularly downwards, with an inclination backwards, in consequence of which inclination the foramen magnum and its condyles form the most posterior and inferior part of the skull. The opening of the foramen is in the same parallel with the opening of the nasal bones.

The relative shortness of the frontal and correlative elongation of the parietal bones is worthy of remark; as well as the development of the entire longitudinal dimensions of the latter, upon the superior surface of the cranium.

The forehead is rather convex, and is sloped without any sudden dip to the nose, which latter is somewhat arched. A slight longitudinal ridge extends from the lambdoidal suture down the centre of the skull a little beyond the anterior limits of the cores of the horns. There is no symptom on the skull of lachrymary sinuses.

* A. Bubalis, the sinus discovered by Blumenbach and A. Thâr; the sinus discovered here, by Dr. Bramley, from a skull in my possession.



Front and oblique view of the Scull of the
Antelope Hodgsonii

J.B Tassin Lith.

The molar teeth are only five in number, on each side of either jaw*. The eight incisors of the lower jaw are unusually erect, close, uniform, rounded, with broadish crowns.

The Horns.

		feet.	inch.
Length of the horns, in a straight line		2	0
Do. do. along the curve		2	$1\frac{1}{2}$
Basal diameter, fore and aft,	between the two lowest rings,	0	$1\frac{7}{8}$
Do. do. side to side,	between the two lowest rings,	0	$1\frac{1}{8}$
Basal interval		0	$0\frac{3}{8}$
Terminal interval		1	2

The skull and horns above described are those of an old male, the incisor teeth being long and full of marks, the sutures half obliterated, and the cristæ prominent.

In regard to the precise form and curvature of the horns, I may observe, in addition to what was said in the Gleanings No. XXIII. that if you lay a horn, separated from the skull, on a table, with that side downwards which in the natural state faces laterally *outwards*, and apply your hand to the base of the horn, so as to make it rest fairly on the table, you will find the horn touch the table at two points; one, the base merely, the other, the space of an inch situated within four inches of the tip. In other words, these two points form the ends of a long, gentle, lateral curvature, the bend of which is inwards, and its utmost divergency from the chord of the bow, or plane of the table, barely $\frac{3}{4}$ of an inch.

The tip of the horn you will observe to be elevated from the table about $\frac{3}{4}$ of an inch; which is caused by a pretty decided inflexure of that part. In young animals, this lateral bend, with the incurvation of the points of the horns, is scarcely traceable: nor is it other than trivial in the oldest. The great bend is the forward one, which is so material, that if you lay the horn on the table with that side downwards, which is the *frontal* surface in the natural state of the animal, (the horn must be supported to make it keep this position,) you will find the horn to touch the table only at the very extremities, the whole of its length being carried off the plane of the table in a bow, the most divergent point of which rises nearly 3 inches from the table, and is situated about $\frac{2}{3}$ of the horn's length from its base.

* Three skulls of old animals now by me exhibit uniformly this number of molars.

In size, the horns vary from 22 to 27 inches of straight measurement, and are straighter in proportion as they are less fully grown. The number of the annuli seems to depend on the size of the horns; their development, not so; for in the smallest that I possess the rings are as strongly marked as in the largest. The rings are round-edged, and very fully and uniformly displayed on the frontal surface; much less fully or regularly on the dorsal and lateral surfaces; round both which the annuli are apt to be continued brokenly only and evanescently. As if, however, to prove that the true character of these marks is annulation, you will sometimes find a ring carried all round the horn in equal and full development. The divergency of the horns at their tips is usually as half their length: the interval at the bases so small, that the little finger can barely be passed between the horns in that part.

The lateral compression is always strongly marked, and extends evanescently to within about six inches of the tips of the horns.

The terminal portion is smooth and rounded, and the extreme points sharp, and turned inwards as well as forwards.

Nepal, March 1, 1832.

III.—*Note relative to the Account of the Cervus Jarâi, published in the Gleanings, No.* 34, *by the same.*

In my description of the Jarâi, above alluded to, I observed that it has "no peculiar elongation of the hair on any part of the body."

The materials of that description were chiefly derived from the examination of a living animal; which examination was conducted in August, or at the height of the hot-weather, when, there being really no signs of such elongation of the hair, I stated the fact accordingly.

Subsequently, it occurred to me, that the hairy covering of the Ruminantia is apt to vary considerably in character with the seasons as well as with increasing years, and I therefore again visited and examined the individual in question (a young male), in the begininng of February; when, somewhat, to my surprise I confess, I found the inferior surface of his head, as far forwards as the gape, the whole of his neck, and the top of his shoulders, invested with shaggy hair more than twice the length of that of the body. So adorned, the animal is readily assignable, (with the assistance of Griffith's Cuvier, a copy of which I have just received from my bookseller,) to the *Rusa* group of Major H. Smith, and possibly to the species *Equinus* of that able writer. Since my description of the Jarâi was composed, I have received some splendid spoils and important

additional information relative to this animal, or rather group of animals; for, it would appear, by the testimony of some most respectable Nipalese, supported by skins, horns, and skulls, in my possession, that there are at least three distinct species (or most strongly marked varieties) of the Jarài, inhabiting the Saul forest.

The Nipalese distinguish them, with reference to the different shades of their in general uniform dark colour, by the epithets Phúsro, Râto, and Kâlo, or gray, red, and black, Jarâi. The Phúsro is the largest, being not less than a horse in size; and has his dark hide copiously sprinkled with Phúsro or hoary. The Râto is the next in point of size; and is of a redder hue. The Kâlo is the smallest, and of a shining, clear black.

The horns of the Râto and Phúsro have a similar form and character, the only *invariable* difference between them being, that those of Râto are considerably less in proportion. The horns of the Kâlo, on the other hand, present a character, not merely alien to the two others, but to the type and index of the group; for they have only one antler on each beam, viz. a brow antler.

All three species have the forehead flat or sunk, with a strong ridge down its centre; the nose straight; canines in the upper jaw, large lachrymary sinuses; shoulders, whole neck, and jaws, shaggy; very coarse, dark hair; longish tail; fan-like ears; massive rough horns, inclined outwards and backwards, which are set on stout pedicles, terminated by large granulated burrs. All, too, but the Kâlo species have a subterminal, as well as a brow antler.

The whole of the above characters are constant. But no reliance can be placed on the circumstances of the superior antler being thrown off near the top, or near the centre, anteriorly and externally; or, posteriorly and internally: nor upon that of the inferior antler being basal, or only subbasal.

I make these remarks, guided by Major H. Smith's admirable work, with ten good specimens before me; and I feel pretty confident that, that able author will find reason by and bye to abandon his present distribution into species of this group of Deer. With the wish to be of service to him I subjoin drawings of the horns of the three presumed species of Nipal; but shall not attempt any further description of them at present. I apprehend that the Nipalese Phúsro Jarâi is identical with the great Rusa, or Hippelaphus, of Cuvier; that Cervus Equinus may be the Râto Jarâi; and possibly, the Rusa Ilam of Raffles (which he says is smaller than Equinus and black-coloured) the Kâlo Jarâi of Nipal.

IV.—*On Modes of obtaining Important Results by Simple Means.* *By* Capt. G. Twemlow, *Bomb. Arty.*

1st.—Movement of heavy masses without expence of Machinery.

Most persons may some time or other have to raise heavy bodies, or move ponderous masses, without having command of modern mechanical means; a few retrospective glances to the probable modes practised in ancient times, by comparatively rude nations, may perhaps elicit useful hints.

We know that in very remote times, enormous stones, such as no modern machinery could be made to lift, were placed on the tops of walls, or fixed over pillars to form gateways: for instance, "in the ruins of Balbek, (the ancient Heliopolis of Syria,) there are three stones lying end to end, in the same row, extending sixty-one yards. One of them is sixty-three feet long, the other two sixty each; their depth is twelve feet, and their breadth the same; and, what adds to the wonder, they are raised up into the wall above twenty feet from the ground*." Were these stones swung up by machinery? most probably not; labour having been cheap, it is far more probable, that as the masonry advanced, an inclined plane of earth would be progressed; up which the common materials would be conveyed by donkies, camels, and labourers, as we read of in the accounts of ancient works: and this in hot climates would admit of lime-cement binding well and gradually. Having the inclined plane, there would be no difficulty in rolling the sixty feet in length stones up it, to their intended positions on the top of the wall, there being an inclined plane on each side. When the work was finished and the cement (if used) been allowed time to bind, the earth would be removed, and be used in levelling the grounds, forming terraces or in other modes. It will be found that in eastern climes the expence attending this mode of scaffolding is much less than that of machinery, where very heavy masses have to be raised†. Let us take another instance.

Suppose you had to place on two erect pillars, or pointed rocks, an enormous impost stone, similar to the egg-shaped stone said to be still existing in the parish of Constantine, Cornwall, England. "The longest diameter of this stone is thirty-three feet, pointing due north and south,

* Extract from Maurice's Indian Antiquities, vol. vi. page 142.

† In throwing arches of small span, the cheapest plan for (or instead of) centerings, where labour is cheap, is to erect two temporary walls; and fill the space between them with earth, or stones, bricks, &c.

end to end; it is fourteen feet six inches deep, and contains at least seven hundred and fifty tons of stone*."

Say the pillars are twenty feet in height, and firmly embedded, would you not be at a loss how to apply modern aids or obtain fulcra? Yet the thing is easy of accomplishment, if we would condescend to do what the people of old would have done; that is to say, employ the cheapest mode of imbedding the two pillars up to their tops in earth, so as to form an inclined plane equally all round them. Now, suppose the impost stone to be at the foot of the inclined plane, what would be the least expensive mode of rolling it to the top? I will give one plan to be followed, should there be no mechanical aid available other than obtainable by levers and ropes—men however being plentiful. Having procured twenty stout timbers of twenty-five feet in length, to one end of each I would attach a cable; the other ends I would insert at equal distances apart, perpendicularly (or rather sloping backwards) along the upper surface of the mass to be moved; the ropes being pulled on, by a sufficient number of men, the levers must be brought down to the ground, making the mass of stone turn nearly a quarter of its circumference, having people ready with earth and stones to throw behind it, to prevent retrogression: the stone-cutters will then cut out another set of lever-insertion holes, the levers be again applied, and the stone be turned over a second quarter turn; and so on, until there are lever-insertion holes on the four sides†, so that it may be turned over and over until it gets to the top, and is fixed on the pillars: then remove the earth, and the task is accomplished. If it should so happen, that the number of men are deficient to furnish power to pull down the levers, the cables might in that case be made fast to anchor stakes on the reverse inclined plane, taking a double turn of each; then by twisting the two ropes with hand levers inserted between them, enormous power may be obtained: this in fact was the power of the catapult and other ancient artillery. In the Dekhan, the power of twisted ropes is to this day made much use of. A *kúbi* (cultivator) will pile up an enormous height of straw on his cart, and then throw over the load several sets of ample ropes, with snatch-blocks of a simple construction at each end of them fastened to the side of the cart; then by twisting the ropes he will compress his load to a surprising degree.

Now let us consider how to move by simple means, masses which are nearly cylindrical, to considerable distances. For instance, ancient

* Maurice's Indian Antiquities, vol. vi. page 140.

† Not however opposite each other, or so deep as to injure the stone.

pillars or statues, or enormous guns, as trophies. If wood is cheap and abundant, perhaps the easiest plan is, to fit beams of wood round the mass, after the manner of staves, so as to barrel it up into the shape of a cylindrical roller.—It has been practically proved, that an iron 18 pr. siege gun, weighing forty-two hundred weight, barrelled up in this way, the staves being about five inches thick, fitted exactly to the rings, astragals, and fillets of the gun, will travel easily on good roads with four gun bullocks, and over common roads with eight bullocks of 54-inches standard; inequalities in the roads, or even heaps of stones which would upset a gun carriage, are no obstruction to the barrelled up gun; some part of the cylinder is sure to act as a wheel. Narrow ravines or passes would be the only difficulty: the neck of the caseable has a ring passed over it, and forms the axle at one end; whilst an axle arm inserted in wood is driven into the muzzle of the gun, to form the opposite axle of the cylinder.

The Bíjapúr gun, which weighs about forty two tons, might be moved to the coast in this way with forty pairs of good gun bullocks. It should be encircled with staves of tough wood, twelve inches in thickness, closely fitted to the surface of the gun: the staves to be dove-tailed and cross-pinned together, and then strongly hooped up; the centre of the cylinder to be purposely made rather larger than the ends, to admit of driving the hoops tight, and also to enable it to travel better: it would then form a roller six feet in diameter and fifteen feet in length, and might serve to roll a road to the coast. A powerful capstan (such as that described in the Memoires D'Artillerie, vol. 2., third edition, page 156,) might be carried on a cart to aid in passing the cylinder over mountains, and to drag it through rivers. It is believed that this plan would be better than two or more broad girdles or wheels round the gun. Let it not be supposed, however, that artillery officers of the present day would have any difficulty in making a suitable carriage for it: if it were desirable to go to that expense, a carriage might easily be made. An Italian of Otranto, who served in the Moghul armies, under the title of Rúmí Khan, had this gun in his park, and used it in several battles, occasionally firing sacks of copper coin out of it.

(To be continued.)

V.—Scientific Intelligence.

1.—*Progress of the Indian Trigonometrical Survey.*

Plate I.

The measurement of the base line on the Barrackpúr road was completed on the 21st January, and it is difficult to imagine that any similar work was ever brought to a more successful issue. Through the politeness of Captain Everest, the Surveyor General and Superintendent of the Trigonometrical Survey, we enjoyed the advantage of an invitation to witness the remeasurement of the first day's work, with the view of ascertaining what might be the probable amount of error: on which occasion the President of the Physical Class of the Asiatic Society and many distinguished officers of the Engineer department were present. An elegant breakfast was laid out in tents after the ceremonies of the morning were concluded. While contemplating with admiration the order and precision with which the whole process was conducted, we took an opportunity of sketching the apparatus as it stood, that the readers of the Journal might be better able to comprehend the nature of the operation of measurement which was partially described in the Gleanings for November last.

Plate I. represents the six sets of bars resting upon their tripods, levelled, and in the act of adjustment, longitudinally, by means of the directing or boning telescope, to the left hand. The boning telescope ought to have been considerably more distant from the bars, but it would then necessarily have been excluded from the drawing. A movable covering of tent-frame work protects the bars from the influence of the morning sun; at their left extremity is seen a cast-iron tripod, firmly imbedded in the ground, bearing a brass vertical cylinder and plate, upon the surface of which is the minute dot which marks the termination of the last, and acts as the starting point of the present measurement: by the adjustment of the cross wires of the end microscope in the true vertical line bisecting the dot. These apparatus are represented on a larger scale in the foreground; as also one of the wooden boxes containing the compound bar, shewing the two projecting tubes, within which lie the cross levers of the compound bars, upon which are engraved the dots, or marks to be read off by the double microscopes interposed between each box, as described on a former occasion, and as will be readily comprehended by reference to the drawing. The right extremity of the line is seen to enter the door of the tower, where it terminated in a coincidence with the original dot, engraved upon a metallic disc attached to a sunken stone pier.

As it had been anticipated that the settling of the masonry of the tower might derange the terminal mark, precautions had been taken in the first instance to sink into the ground another adjusting point at a short distance in advance of the tower; and it was in fact to this point that the remeasurement was referred, to know the probable amount of error in measuring, as well as whether the tower had altered its position in any perceptible degree.

From conversation with the officers on the ground we picked up the following particulars regarding the Barrackpúr base. We must crave their indulgence if our memory leads us into any mistake in detailing them.

The measurement commenced on the 23d November 1831, and ended on the 21st January 1832, an interval of 58 days, of which 13 may be set down as holidays; so that the actual time employed was about 45 days. The length of the ground measured upon an average was 750 feet, or 12 sets of bars: but towards the conclusion, so systematic had become the arrangements, that 18, 20, and once 24 sets (that is 1512 feet) were measured in one day, which is double what was effected on the Irish

survey: this was chiefly attributable to the number and experience of the officers employed; whose names we must be allowed to record, as we observed them at their posts.

At the boning telescope,.. Lieut. Western, Engrs. with Lieut. Bridgman, Art.
First microscope,..... Mr. J. Taylor, astronomer at Madras.
Central microscopes,.. Mr. Logan, Mr. T. Oliver, Mr. J. Peyton, Mr. M. Torrick, Mr. W. Rossenrode, } Of the Madras Trig. Survey.
Last microscope,..... Lieut. R. Wilcox, Surveyor of the Brahmapútra River.

The length of the BASE between tower and tower was nearly 34,000 feet, or 6.4 miles, being 539 sets of bars. The whole of this extensive line came within the limits of the Barrackpúr road, falling about 30 feet to the eastward of its centre at one place; and the greatest deviation from horizontality in the road was at about a mile from the south tower, to which point it sinks gradually about 5½ feet.

At the north tower, it was found beforehand that there would be about 3 feet to spare in excess of a certain number of bars. This, added to the possibility of the dot on the centre stone moving during the settling of the tower, induced Captain Everest to adopt the expedient of sinking a heavy stone of 3½ feet cube, into the ground, at the distance of one set of bars south of it: two brass plates were let into this, one to receive a dot at the exact distance of a set of bars from the tower, and one to receive the dot terminating the 538th set. By this arrangement the surplus interval could be measured at leisure, with the same accuracy employed throughout the remainder of the line.

The difference found on remeasuring eleven sets of bars was .026, or one-fortieth of an inch on 700 feet—a surprizingly small quantity, and only one-third of what was experienced in the previous trial at Lord's cricket ground. To form a tangible idea of the error this might induce upon the result, it is sufficient to say, that it would amount to about 12 feet between Calcutta and Delhi, or 125 feet in the diameter of the great globe itself.

This, it must be remembered, is without applying any correction for temperature, though the two measures were taken in November and January: and it is a convincing proof how well the compensation had been adjusted in England.

The southern tower was found to have moved one-thirteenth of an inch to the south-east, which is not surprising, considering the light nature of the soil, and the height, 80 feet, to which the building was forced to be raised to place the theodolite within view of the other triangle stations.

Upon the conclusion of the great work, the bars were brought to Calcutta, to be recompared with the standard at the Surveyor General's office. But for the minute particulars of this and all the other processes we must wait for the public account that will doubtless be eventually given of the whole operation.

We hear that Lieutenant Western is now deputed to carry a meridional series of triangles southwards from the Parisnath meridian on the longitudinal arc, to Cuttack. After which the same meridian is to be prolonged northwards to the limits of our frontier. We presume, that the bars will shortly be transferred to the neighbourhood of Agra, where another base will be necessary for the primary meridian. Should an intermediate line be required, none could be found better suited to the purpose than the military road between Benares and Allahabad, which enjoys the same advantages of straightness, even level, and hard materials, with that of Barrackpúr; added to much greater openness of country.

2.—*Climate of Vera Cruz.*

Allusion was made in our last, to a meteorological register kept by Fray Juan, at Vera Cruz; as the tables whence the notice was derived are in manuscript, we think it will be interesting to publish the following abstract of them, drawn up for the purpose of elucidating the subject of the barometric tide.

Table of Observations on the Barometer and Thermometer, at Vera Cruz, by Fr. Juan, 1817, 1818.

Month.	*Thermometer.*			*Barometer at 32°.*		
	6 A. M.	Noon.	10 P. M.	6 A. M.	Noon.	10 P. M.
January,	68.0	70.3	69.8	30.052	.069	.034
February,	69.0	71.5	70.7	.043	.050	.034
March,	72 1	75.6	74.7	.000	.002	.002
April,	76.8	80.7	79.7	29·879	.885	.871
May,	79.2	84.1	83.1	.860	.866	.855
June,	80.6	83 9	82.8	.828	.830	.825
July,	79.8	83.4	82.2	.955	.954	.957
August,	79.9	83.6	82.6	.890	.900	.897
September,	79.7	82.3	82.3	.897	.909	.909
October,	78 6	81.0	80.4	.907	.918	.928
November,	74.6	77·7	76.7	.965	.966	.964
December,	69.7	72.6	71.6	30.025	.044	.048
Means,	75.66	80.56	78.05	29.941	.950	.943

3.—*Range of the Barometer at Berhampúr.*

We also alluded to the barometric observations made by the late Dr. Alexander Russell, at Berhampúr, in 1820—21: of these too, we take this opportunity of putting on record an useful summary made out by a friend, and reduced to the temperature of 32°, by applying the correction calculated from the thermometric register kept in Calcutta, for want of the local observations: the differences cannot be very great.

Month.	Sun-rise.	Maximum between 9 A. M. and noon.	Minimum between 4 P.M. and 6 P. M.	Diurnal Tide.	10 P. M.	*Rise* to Sun-rise.
	inches.	inches.	inches.	dec.	inches.	dec.
January,	29 915	29.925	29.831	0 094	29.881	0.034
February,	.850	.874	.766	.108	.824	.026
March,	.762	.788	.699	.119	.693	.069
April,	.669	.686	.570	.116	.661	.008
May,	.553	.570	·466	.104	.533	.020
June,	.450	.453	.382	.071	.438	.012
July,	.450	.457	.401	.056	.450	.000
August,	.494	.501	.413	.088	.480	.014
September,	.615	.620	.563	.063	.604	.011
October,	.783	.803	.740	.063	.774	.009
November,	.837	.861	.781	.0 0	.828	.009
December,	.904	·922	.826	.096	.877	.027
Means,	29 690	29·705	29.619	.086	29.670	.020
Range,	.465	.472	.459		.443	

4.—*Hourly Observations of the Barometer in the Fortress of Cavite.*

The following notice, extracted from the Royal Institution Journal, No. IV. bears upon the same point; and from the blank left opposite to the second fall, we may conjecture that in fact the existence of this fall or nocturnal tide was hardly borne out by the observations when corrected for temperature, although from being apparent before correction the words remained unerased.

These observations were made by the scientific men attached to Captain Kotzebue's expedition in the year 1823—1826, on the Island of Luzon (14° 34′ north lat., and 239° 9′ west of Greenwich), for ascertaining the periods of its regular falling and rising during twenty-four hours. The barometer was kept in a room six toises above the level of the sea, in which the temperature was nearly the same day and night, (about 25° Centigrade, or 77 Fahr.) and the observations were made on eleven different days between the 12th and 26th of December. The following are the general results deduced from the whole of the observations. The barometer has a maximum of height at 9° 1′ 1″ A. M.

it then falls till	4	28	6	P. M.	on an average	1.04 line ;
it rises again till	9	58	3	P. M.	,,	0.687 ,,
and falls again till	4	30	0	A. M.		——
lastly it rises again till	9	1	1	A. M.	on an average	0.445——

5.—*Dr. Wise's Ice Manufacture at Húglí.*

Dr. Wise hopes to maintain a constant supply of ice, in Calcutta, for the next two or three months. Last cold season, although apparently so favorable for its production, did not afford more than 15 nights in which ice would form; and of these, only three or four were really good nights. In consequence of this, instead of 3,000 *mans* as expected, only 1,000 *mans* were secured; which, from the precautions taken, will, perhaps, answer for several months. Dr. W. has devised the following simple and effectual method of using the ice. The ice is contained in a stuffed bag, having two, three, or four holes in its under-part, with padded flaps to close them. The necks of the bottles to be cooled are thrust upwards through these holes; when not wanted, the bag is put into the upper part of a stuffed basket and wrapped round with a blanket.

VI.—*Proceedings of Societies.*

1.—Asiatic Society.—Physical Class.

Wednesday Evening, 8th February, 1832.

The Honorable Sir Edward Ryan, President, in the Chair.

The following Donations to the Museum were presented:

1. Specimens of the Limestone of the Sylhet quarries, from William Cracroft, Esq.

Impressions of *nummulites* abound in the limestone of the Chirra hill, west of the Sanatarium. *Turrilites* are less common, and impressions of bivalves, resembling *pectens*, are still more rare. The interior of the shells is filled with carbonate of lime, crystallized, of a brown colour.

No. 5. A granular limestone, stated, in Mr. Cracroft's list, to be "a poorer lime than the others in the kiln," proves to be a crystallized dolomite; and this circumstance accounts for the occasional mixture of magnesia in the Sylhet lime of the Calcutta market.

There are also specimens of *amygdaloid*, (containing worn crystals of *felspar*,) and of a fine plastic micaceous clay, from below the sandstone of Chirra Punji.

2. A stuffed specimen of a species of Felis, native of the Midnapur jungles, from Dr. J. Pearson.

It is classed and described in the following manner, by Doctor Pearson :

" Trib.	*Digitigrades.*	Cuv.
Fam.	*Felinæ.*	
Gen.	*Felis.*	Lin.
Sp.	*Kutas.*	Mihi.

Gen. Ch.—Incisors $\frac{6}{6}$; canines $\frac{1}{1}\frac{1}{1}$; cheek teeth $\frac{4}{3}\frac{4}{3}$: the fourth in the upper jaw transversely situated. Jaws short. Toes, on the anterior extremities, five; on the posterior, four, armed with retractile claws.

Sp. Ch.—Ground colour, greyish brown, approaching to rufous at the sides of the abdomen, and neck, where it unites with the white of those parts ; and marked with darker stripes and bands, which are more or less obscure. Inferior surface, chin, and throat, white. Ears, white within ; externally rufous ; with an irregular dark patch at their lower part, tipped with black and slightly pencilled at the tips. Labial whiskers, some entirely white, and a few all black ; whilst others are black for a very small space at the base, the remainder being white. Tail, short, grey, annulated with black, from the middle to the extremity. Legs, greyish, rufous above, and rufous below ; with bands of dark-grey, which become on the inner side of the elbow and fore arm almost black. Tarsus, metatarsus, and toes, rufous, darker behind, and almost black at the heels ; length from the tip of the nose to the insertion of the tail, two feet two inches ; length of tail, ten inches. Height, at the shoulders, one foot two inches ; posteriorly, one foot four inches. Caudal vertebræ, twenty.

The size of the Kutas is that of a large Chacal, though not so robust as that animal. The darker shades on the sides appear as though they had been less obscure in the youth of the animal, and gradually fading, become broken stripes and even spots, in their progress to a total obliteration ; a circumstance which, as there is reason to believe, occurs in more than one species of this family. My specimen is a full grown, but not an old male ; the female, and the young, I have never seen.

I have looked through a list of the species described in the Monograph of the Felinæ, by Mr. Temminck, without being able to satisfy myself of that distinguished zoologist having met with the animal I now present to the notice of the Society : nor can I discover it in the Synopsis, appended to Griffith's translation of the Règne Animal ; and therefore I have ventured to designate it by the name which is given to it by the natives of Midnapur. The Felis Chaus, Bruce's booted Lynx, would appear to differ in colour, and length of tail ; and the Kutas is destitute of the black at the hinder part of the leg, which forms so distinguished a feature in that animal, having merely an approach to it, in a dark shade of rufous brown. The Bengal Carocal, of Edwards, differs still more in colour and length of tail. Should, however, the Kutas prove to be identical with any known species of Lynx, my name can readily be dropped."

3. A series of the land and fresh water shells of the Doab, and of the Gangetic provinces, presented by W. B. Benson, Esq., C. S.

Land Shells.

1. *Helix*—from banks of Ganges, in Behar, and of the Betwa, in Bundelkhand.

2. *H.*,———. Lamarck—Bundelkhand and Behar. The exuviæ plentiful above Húglí.

H.—*Macrochlamys Indicus* (Benson), separated from Helix, on account of the difference of character in the animal.

3. *Pupa*—Bundelkhand and Doab.

4. *Bulimus*—allied to *B. Bengalensis*, Lam. Bundelkhand and Doab.

5. *Bulimulus*—under stones and pots, and among grass. Doab and Bundelkhand.

6. *Succinea*—sides of ravines. Etaweh.

7. *Carocolla reversa*—a variety from banks of Jellingí and Sikhrigali.

8. *Cyclostoma Beharicum*—Benson—Pathargháta.

9. Ditto ditto, variety.

10. Ditto young of ditto.

11. Ditto *granulata*—Bundelkhand and Doab.

Fresh-water Shells.

12. *Planorbis*—Jhíls in the Gangetic provinces.

13. *Lymnæa*—Jhíls near the Sinde, Bundelkhand.

14. Ditto—Bhagea nala, near Kalinjar.

15. *Melania*—From the Gúmtí: observed the exuviæ of this hill in Jellingí, at Kishennagar.

16. Ditto—Ganges, its branches, and Salt-water lake near Calcutta.

17. Ditto—Gumtí and Gogra.

18. *Paludina Bengalensis*—Jhíls of Gangetic provinces.

19. Ditto *ceramcopoma*—ditto and adhering to rocks in the river Kén.

20. *Ampullaria*—from jhíls in Bundelkhand.

Fresh-water Bivalves.

21. *Cyrena*—Ganges and its branches.

22. *Unio*—Gúmtí and Gogra.

23. Ditto—Ganges and its branches.

24. Ditto—Jumna and Ganges.

25. Ditto—Ganges and branches.

26. *Novaculina Gangetica*—Benson—Jumna.

Mr. Benson has further obliged the Society by classifying the shells formerly received from Dr. Pearson of Midnapúr; they consist of the following:

FRESH-WATER SHELLS.	LAND SHELLS.
1. *Planorbis.*	5. *Helix.*
2. *Melania.*	6. *Carocolla.*
3. *Paludina Bengalensis.*	7. *Bulimus Bengalensis*,—a variety with three lower bands on the whorl.
4. *Ampullaria.*	

8.—*Cyclostoma.*

To these catalogues, for the sake of reference, the following list of American shells presented in the name of Mr. Lea, at a former meeting, is subjoined.

24 varieties of the *Unio*, chiefly from the Ohio river.

U. tuberculatus, Barnes. *U. æsopus*, Green. *U. perplexus*, Lea.
U. ovatus, Say. *U. metanever*, Rafin. *U. zigzag*, ditto.
U. plicatus, Lesueur. *U. ellipsis*, Lea. *U. undulatus*, Barnes.
U. securis, Lea. *U. pustulosus*, ditto. *U. foliatus*, Hildreth.
U. nasutus, Say. *Schuylkill.* *U. complanatus* [*purpureus.*] *U. gibbosus*, Barnes.
U. torsus, Rafin. *U. irroratus*, Lea. *U. cariosus*, Say, Sch.
U. occidens, Lea. *U. siliquideus*, Barnes. *U. rectus*, Lane.
U. mytiloides, Rafin. *U. cuneatus*, ditto. *U. circulus*, Lea.

Venus, Mercatoria, N. Jersey.
Symphynota alata, Lea, Ohio.
ochracea, Sch.
Solen ensis, Lam. N. Jersey.
Achatina vexillum, do. Cuba.
Alasmadonta, undulata, Say, Sch.
Murex capillis, Massts.
Spirula peronia, Florida.
Petricola fornicata, Say, N. Jersey.

Melunia Virginica, Say, Sch.
conica, ditto, Ohio.
canaliculata, ditto, ditto.
multilineata, ditto, Sch.
armigera, ditto, Ohio.
Helix, albolabris, Say, ditto.
thyroides, ditto, ditto,
anculosa preciosa, ditto.
Turbo, irroratus, New Jersey.
muricata, Cuba.

Mr. Benson, on departing for Europe, begged the Society's acceptance of his copy of Lamarcke's "*Histoire Naturelle des Animaux sans vertèbres*," the five first volumes.

4. A letter was read from Dr. Royle, late Superintendent of the H. C. Botanical Garden at Seháranpúr, presenting to the Society—

1. A plan and description of the Botanic Garden at Seharánpúr, with catalogues of the contents of the Garden and of the Herbarium. [Printed in the present Number.]

2. Drawing of the Alpine Hare, or *Pika* of Buffon, of the natural size, from the Chúr mountains, at eleven thousand five hundred feet of elevation.

3. Specimen of a rich Iron Ore, (magnetic,) from the Phagúní mine, on one of the branches of the Chúr mountain.

4. Specimen of the Trap Rock, or Dyke, discovered near Masúrí by Lieutenant Cautley, from Dr. Falconer.

5. Specimen of the *Bijlí-ke-hár*, alluded to in Captain Herbert's paper.—[Gleanings III. 269.]

A note by the Secretary pointed out that the substance of these bones has not undergone mineralization, as supposed by Captain Herbert, excepting in so far as they are impregnated with iron. The animal matter of the bones takes fire at a red heat, and the bone, on cooling, is of a fine blue colour, resembling the *Odontolite*, or *Bone Turquoise*, of Johns. The composition, on a hasty analysis, was found to be—

Animal matter,	12.
Phosphates of lime and magnesia,	70.
Carbonate of lime,	14.
Oxide of iron,	2.

The interior of the bones is filled with calcareous crystals.

Mr. B. H. Hodgson's paper on the Mammalia of Nepal was then read.

Also, Dr. Royle's description of the Garden at Seháranpúr.

The thanks of the Society were voted for the above contributions.

2.—Medical and Physical Society.

4th February, 1832.

Dr. Madden was elected a Memher of the Society : and Dr. William Chalmers, of Croydon ; Mr. O. Walter, Surgeon, of Dover ; and Senor Don Francisco Xavier Lazo, M. D. Secretary of the Medico-chirurgical Society of Cadiz ; were elected corresponding Members. Hugh Guthrie, Esq. Asistant Surgeon, Bengal Service, requested to return to the Society, and have his name replaced on the list of Members, agreeahle to the resolution passed on the 4th April, 1829, which was complied with accordingly. Several communications were then laid before the Society.

1.—A letter from Dr. J. N. Casanova, a corresponding memher, stating that, as he had resolved to reside permanently in Calcutta, he was desirous of being admitted a resident member of the Society, for the purpose of contributing his subscriptions, and assisting at the meetings ; he was therefore proposed as a member of the Society, by Mr. Egerton and Mr. Twining.

2.—A letter from Dr. Milne, of Bombay, enclosing his 3rd communication on Dracunculus, with three reports, numbered 4, 5, and 6, in support of his opinions on that subject.

3.—A communication from Brigadier O'Halloran to the Secretary, accompanied with the root of a plant similar to that presented at the last Meeting from Dr. Robert Tytler, and said to possess the property of preventing the scorpion from stinging.

4.—A statement from Mr. Boswell, relative to the benefits he had seen follow the employment of venesection in the cold stage of Intermittent Fevers, while he was employed with the Artillery at Dum-Dum, where he had employed this treatment in obstinate agues with invariable success, and only in one instance was obliged to repeat the bleeding in the cold stage.

5.—A letter from H. Guthrie, Esq. with remarks on a native prescription for ring-worm.

6.— A letter from J. L. Geddes, Esq. Assistant Surgeon, Madras Service ; with the statement of a case in which the Madar had proved remarkably successful in the cure of an obstinate ulcer.

7.—A letter from Dr. D. Stewart, of Howrah, stating that, during an excursion to Shikarpore, he had been consulted by a Native young man, who had suffered for five years from nasal polypi ; wherehy his health had become much impaired, and in fact, the patient was reduced to a skeleton. The disease had acquired an enormous bulk, pressing down into the posterior fauces and pharynx, so as to prevent the deglutition of any solid food, and to embarrass the respiration exceedingly ; and probably also to affect the circulation, as the patient suffered from distressing head-aches. The disease was effectually removed hy ligature and torsion.

Dr. Smyttan's Treatise on the varieties of East India Opium, was read and discussed by the Meeting. Dr. S. observes, that the varieties of East Indian Opium seem to be little known or recognised in Europe, and that good Turkey Opium is said to contain nearly three times the quantity of morphine, or narcotic principle, that is found to be procurable from the product of the Bengal provinces. The best produce of the Malwa districts is said to differ from Bengal Opium both in appearance and quality, quite as much as the Turkey Opium does. Dr. Smyttan's opinions are formed from extensive ohservations made while he was Inspector of Opium at Bombay, compared with the records of that office ; and with the experiments made at Calcutta by the late Dr. Jameison in 1821, which are given with a

table in the Appendix: to which is annexed a table of experiments made at Bombay by Dr. Maxwell. The whole of these appear to have been conducted with great care and attention. The general results of a series of experiments conducted by the Author, are corroborative of the accuracy of the tables alluded to in this paper.

At the conclusion of the Meeting, some splendid drawings of Medicinal plants were placed on the table by Mr. Royle.

3.—Societe' d' Histoire Naturelle of the Mauritius.

8th March, and 12th April, 1831.

The Secretary presented to the Society, the Baron Cuvier's *Analyses des Travaux de l'Académie des Sciences de Paris*, for 1822, 25, 26, 27—in the name of the illustrious author.

Mr. Rob. Lyall, M. D. read a note on the subject of the astronomical observations made by him at *Tannanarivou*, capital of the kingdom of the Ovas, in Madagascar, whence the latitude of the place was found to be 18° 56′ 20″ S. and the longitude 47° 57′ 46″ E. of Greenwich.

The same member also described two plants, met with in Madagascar by M. W. Bojer. One is the *Euphorbia splendens* BOJ. now become common in the gardens of the Mauritius, but of which Dr. L. made known a variety with a yellow flower. The other is the *Poinciana Regia* BOJ. now also naturalized in the island. Both are figured in the last numbers published by Professor Hooker, of Glasgow, a corresponding member of the Society.

M. Liénard Pére read an account of a fish of this island, belonging to the genus *Pleuronecte*, and remarkable for certain rays on the pectoral fins, extending the whole length of the animal; a drawing accompanied. The islanders rank this fish among the soles.

M. J. Desjardins continued his analysis of *Zoologie du Voyage de l'Uranie*, chiefly adverting to the Polypi, which play so important a part in the natural history of the island.

The Secretary also described the hail, which fell in the storm of 8th February, at the *Camp de Masque*, as of the size of small peas, proving destructive to tender plants.

Many letters of correspondents were communicated. One from M. Quoy, of Paris, stated, that M. le Baron G. Cuvier had yielded to the desire of the Society, to become possessed of his bust. The following paragraph added weight to M. Desjardin's observations. "Detruisez done cette opinion populaire *du corail qui entre en fleur*, vous insulaires, vous aurez pour cela plus de facilité et de prépondérance que nous autres qui ne faisons que passer."

A letter from Dr. Smith, of Algoa Bay, announced his intention of publishing the Society's proceedings in the South African Quarterly Journal.

M. Mn. Sauzier, of Bourbon, wrote that the volcano of that island had several violent eruptions in November, December, and January, from two distinct craters. There was no flow of lava, as had been reported at St. Denis.

The president communicated the notes of M. J. Cameron, of Madagascar, relative to some minerals, particularly to an aerolite which fell on the Mozambique coast. Mr. C. announced that the Queen of the Ovas, Ranavalon Manzaka, had bestowed an annual donation of £60 towards the expence of a practical course of chemical lectures, which many of her subjects are already sufficiently educated to understand and appreciate.

Mr. Bernard, Proviseur du Collége Royal, and Mr. J. N. Casanova, D. C. M. were admitted honorary members of the Society. The latter presented his work entitled "Examen de las Aguas minerales de San Pedro, &c. 1827."

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of February, 1832.

Days of the Month.	Minimum Temperature observed at Sun-rise.					Maximum Pressure observed at 9h. 50m.					Observations made at apparent Noon.					Max. Temp. and Dryness observed at 2h. 49m.					Minimum Pressure observed at 4h. 0m.					Observations made at Sunset.					Rain Gauge, No. 1.	Rain Gauge, No. 2.
	Barometer reduced to 32°.	Temper. of the air.	Depres. of M.B Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°	Temper. of the air.	Depres. of M.B.Ther	Wind.	Aspect of the sky.	Barom. red. to 32°	Temper. of the air	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°	Temper. of the air.	Depres. of M.B Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air	Depres. of M.B.Ther.	Wind.	Aspect of the sky.		
1	30,(32	52.7	1,2	cn.	ci.	,085	67,	12,1	n.w.	ci.	,025	74,3	17,1	n.w	ci.	,973	77,8	18,3	w	cl.	,967	77,	18,1	w.	cl.	,975	70,	10,1	cm	ci.		
2	,015	54,3	1,1	do.	cl.	,091	69,5	6,6	do.	do	,036	75,3	17,3	do	do.	,996	78,	19,3	n.w.	ci.	,993	77,3	19,4	n.w.	ci.	,009	72,	13,3	n w	do		
3	,089	52,3	1,8	do.	do.	,130	69,	10,3	cm.	cl	,083	75,	17,5	do.	cl.	,012	76,8	20,3	do.	cl.	,998	76,	19,5	do.	cl.	,002	69,7	10,2	cm	cl		
4	,038	52,3	1,1	do.	do.	,086	70,3	11,6	n.w.	do.	,097	75,	16,1	do.	do.	,973	75,5	20,3	do.	do.	,963	78,	17,3	do.	do.	,9.1	72,	12,3	do.	do.		
5	,015	55,5	1,	do.	do.	,046	71,	4,8	n. e.	cu.	,008	75,7	7,2	n. e.	cu.	,915	78,7	9,8	w	cu.	,009	78,3	10,3	w.	cu.	,919	74,5	7,	do.	do		
6	29,967	53,5	4,7	n.	cis.	,022	69,7	12,5	n.	do.	,989	76,7	17,8	n.	do.	,935	80,5	16,6	n. e	ci.	,926	79,5	14,3	n. e	ci.	,936	72,3	6,4	do.	ci.		
7	30,020	57,7	5,7	do.	ci.	,067	69,7	12,8	n.e.	cl.	,046	77,3	15,6	u. e.	ci.	,999	79,	17,1	n.	do.	,958	78,7	17,	u.	do.	,973	72,	8,3	do.	cl		
8	,039	55.6	5,1	n. e.	do.	,081	69,	13,5	do	ci.	,045	77,	18,1	do.	cl.	,976	78,	17,9	n. e	cl.	,960	77,	14,5	n. e.	cl.	,963	72,	8,3	do.	do.		
9	,032	57,3	2,6	cm.	do.	,081	69,8	8,8	n.w.	do.	,013	77,7	12,5	n.w.	ci.	,971	89,3	12,6	n.w.	cu.	,969	77,5	11,3	n.w.	cis.	,979	73,	4,8	do	cis		
10	,015	63,5	1,6	do.	fg	,040	70,7	2,5	s. w	cu.	,071	80,5	8,8	s. w.	cu.	,919	83,6	14,1	s. w.	do.	,912	83,	13,1	s w.	cu.	,911	78,5	7,3	do.	cl.		
11	29,954	67,5	1,3	do.	do.	,988	75,	5,1	do.	do.	,958	82,3	10,6	do.	do.	,857	83,3	11,4	do.	do.	,856	82,7	11,2	do.	do.	,864	78,3	8,1	s. w.	cus.		
12	,907	63,3	1,6	do.	ci.	,951	77,3	11,6	do.	do.	,868	81,	14,8	do.	do.	,806	86,5	17,5	do.	cl.	,800	84,5	17,	do.	do.	,810	80,	9,3	cm.	cl.		
13	,912	66,3	3,6	n. e.	cus.	,944	73,5	6,8	w.	do.	,871	80,5	9,6	w.	do.	,797	83,	12,8	w.	cis.	,797	82,5	14,8	w.	cis.	,805	79,5	12,8	w.	cis.		
14	,875	69,5	1,3	s. w.	cy.	,935	77,	5,3	s. w.	do	,892	81,	8,3	s. w.	do.	,806	85,	13,8	s. w.	cu.	,776	84,5	12,3	s. w.	cu.	,819	71,3	4,1	n. e.	cl.		
15	,900	67,5	1,8	cm.	cis.	,941	71,	3,8	cm.	cis.	,935	73,	3,8	w.	n.	,924	69,5	3,6	w.	n.	,923	69,	4,1	w.	n.	,934	67,5	3,6	n.w.	n.		
16	,956	62,3	2,1	n.	n.	,007	62,5	1,	n. e.	rn.	,985	62,3	1,4	n. e.	rn.	,921	63,3	1,6	n. e.	do.	,886	63,	1,8	n. e.	do.	,886	62,7	1,2	n. e.	cus.		
17	,955	62,5	1,6	cm.	cus.	,036	67,3	3,4	do.	cu.	,016	70,7	6,2	do.	cu.	,962	75,	9,	n.w.	cu.	,963	74,7	8,5	n.w.	cu.	,980	71,	5,8	cm.	cl.	1,65	1,50
18	30,055	61,3	1,1	n.	cu.	,198	69,7	5,9	n.	do.	,079	76,	10,1	do.	do.	,013	76,3	10,4	n. e.	cis.	,007	76,	11,2	n. e.	cis.	,017	72,	6,3	do.	cis.		
19	,019	64,7	1,2	cm.	cis.	,073	72,7	7,8	n. e.	do.	,051	75,5	9,8	do.	do.	,945	79,5	13,3	do.	cu.	,944	78,7	11,8	do.	cu.	,955	75,	9,3	do.	ci.		
20	29,994	59,5	3,3	do.	cl.	,037	70,7	10,	do.	cl.	,989	78,	12,8	do.	ci.	,929	78,	14,3	n.	cis.	,924	76,3	12,1	n.	cis.	,925	73,7	10,5	n-	cis		
21	,951	64,5	6,	n.	cis.	,018	69,5	11,	n.	ci.	,976	72,8	13.3	do.	cu.	,907	76,3	10,4	cm.	do.	,895	75,	10,1	cm.	do.	,901	73,	8,2	cm.	do.		
22	,906	62,5	1,3	cm.	ci.	,932	70,5	5,6	w.	cu.	,893	77,	9,3	w.	do.	,817	80,7	12,	w.	cu.	,779	80,	14,3	w.	cu.	,785	76,5	8,8	do.	cl.		
23	,818	62,7	1,5	do.	cl.	,869	71,5	9,8	s. w.	cl.	,833	78,	13,3	s w.	cl.	,758	82,	16,1	do.	do.	,742	81,3	16,6	do.	do.	,755	77,3	12,6	w.	do.		
24	,820	67,	6,3	n.	cis.	,871	70,5	10,	cm.	cus.	,815	76,	9,8	n.w.	cus.	,738	77,	10,5	n.w.	cus.	,715	76,3	8,3	n.w.	cus.	,730	74,5	5,8	cm.	cus.		
25	,726	64,5	1,7	cm.	cl.	,781	69,8	4,9	n.	cu.	,764	72,5	6,	cm.	do.	,698	76,7	9,5	n.	cu.	,698	75,	8,1	n.	cu.	,720	73,5	6,6	do.	cl.		
26	,784	66,	1,3	n.w.	cu.	,848	76,	11,5	n.w.	cl.	,821	79,7	15,5	n w.	cl.	,737	81,3	17,6	w.	do.	,729	80,	17,1	w.	do.	,761	76,	13,5	do	cu.		
27	,835	65,	7,5	cm.	do.	,891	71,	15,3	do.	do.	,857	75,7	18,7	do.	do.	,782	79,5	19,9	n.w.	cl.	772	78,5	20,	n w.	cl.	,783	73,	14,2	n w.	cl.		
28	,841	56,5	2.4	do.	cl.	,911	71,	13,3	do.	do.	,888	76,5	18,3	w.	do.	,818	79,	23,3	w.	do.	,809	77,3	21,	w.	do.	,828	72,5	14,	cm.	do.		
29	,851	57,	6,3	w.	do.	,899	74,5	16,8	w.	do.	,871	78,3	22,1	do.	do.	,799	82,3	23,8	do.	do.	,788	81,3	21,8	do.	do.	,794	75,	8,5	do.	do.		
Mean	29,943	61,2	2,7			,992	70,9	8,8			,953	76,3	12,5			,885	78,8	14,1			,878	77,9	13,7			,886	73,4	8,7			1,65	1,50

Abbreviations. In the column "wind," small letters have been used instead of capitals; *cm.* means *calm.* In the column "aspect of the sky," *cy.* is *cloudy*; *cl. clear*; *rn. rain*, *ci. cirrus*; *cu. cumulus*; *cs. cirro-stratus*; *cus. cumulo-stratus*; *cc. cirro-cumulus*; *n. nimbus.*